Université de Montréal

Sports, Physical Activity, and Academic Performance: Promoting Physical Activity among Adolescents

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Résumé du mémoire

Les jeunes d'aujourd'hui ne sont pas suffisamment actifs pour en retirer des bienfaits pour leur santé. L'activité physique (AP) présente des bienfaits non seulement pour des paramètres physiologiques mais aussi pour des facteurs tels que le contrôle de soi, la compétence sociale, l'attention/concentration et l'estime de soi, facteurs qui influent à leur tour sur la performance scolaire. Malheureusement, les jeunes de milieux socioéconomiques moins favorisés montrent un niveau moins élevé d'AP et un taux plus élevé d'abandon scolaire. Il s'avère donc crucial de promouvoir l'AP auprès de cette population. Ce mémoire comporte deux parties. La première consiste en une recension des écrits sur les effets de la pratique d'AP sur la performance scolaire, le contrôle de soi, la compétence sociale, l'attention/concentration et l'estime de soi. La seconde partie présente un article de recherche portant sur l'élaboration et l'évaluation d'un programme d'AP extracurriculaire adapté à des adolescents d'une école secondaire multiethnique et défavorisée.

Mots-clés : Promotion de l'activité physique, Promotion de la santé, Adolescent, défavorisé, Performance académique, Contrôle de soi, Estime de soi, Attention/concentration, Compétence sociale, Marketing sociale, Plaisir

Thesis Summary

Today's youth are not getting sufficient physical activity (PA) to reap the associated health benefits. While the physiological benefits of PA are now widely recognized, PA participation can also have a positive effect on variables such as self-control, social competence, attention/concentration, and self-esteem; variables which can, in turn, influence academic performance. Unfortunately, youth of lower socioeconomic status exhibit lower levels of PA and higher rates of school drop out. Thus, there is a need to promote PA among this high risk population. This thesis is composed of two sections. The first is a literature review pertaining to the effects of youth sports/physical activity participation on academic performance, self control, social competence, attention/concentration, and self-esteem. The second section of this thesis is a research article which presents the development and evaluation of a non-curricular PA promotion programme designed for multiethnic, underserved adolescents and implemented in their middle school.

Keywords : Physical activity promotion, Adolescent, Underserved, Academic achievement, Self-esteem, Self-control, Social competence, Attention/concentration, Social marketing, Enjoyment

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Chapter 1

Introduction

In young people, regular practice of physical activity helps to build bone mass and density, and also muscle mass. Additionally, physical activity helps to control body weight, improve lipid profiles, and to develop efficient cardiorespiratory functions (Barnett, Hamel, & Ferland, 2002). However, the benefits derived from regular involvement in physical activity are not merely physiological. Regular physical activity helps to prevent and control feelings of anxiety and depression. Structured and unstructured physical activities provide opportunities for self-expression, building self-confidence, social interaction and integration, and aid in the development of social skills. Furthermore, it has been found that youth who are physically active perform better academically when compared to those who are less active. [1]

[1] Retrieved December 8, 2006 from http://www.who.int/moveforhealth/advocacy/information_sheets/youth/en/index.html

1.1 Physical Activity and Academic Achievement

The question of the effect of physical activity on academic achievement has intrigued researchers for decades (Shephard, 1997). Several have tried to delineate the nature of a possible correlation, but conclusive results are elusive. Some have attempted through experimental means to answer the question as it pertains to children and adolescents but varied methodologies and results make it difficult to assert a direct and absolute connection. In fact, since young people's academic performance is influenced by myriad psychosocial, environmental, and physiological factors, it is perhaps more judicious to seek to understand the effect of physical activity participation on any number of these influences.

Many variables influence academic achievement of youth. Self esteem, for example, has been shown to be positively related to academic achievement (Bankston & Zhou, 2002). Others have shown that inattention strongly predicts academic performance, more so than environmental or family variables (King, McDougall, DeWit, Hong, Miller, *et al.*, 2005). Furthermore, pro-social behaviour, such as social competence and self control, has been shown to positively influence academic success (Rouse, Barnaca-Gomez, Newman, & Newman, 2001). Additionally, skills in regulating behavioural and attention control have been found to be related to academic and social competence (Eisenberg, Guthrie, Fabes, Reiser, Murphy, *et al.*, 1997). Also, according to King *et al.* (2005), participation in recreational opportunities can help develop self-regulatory skills in children which, in turn, can help them to develop pro-social behaviour skills. Finally, low academic achievement

and high school drop out rates are correlated with lower socioeconomic status (Sutton & Soderstrom, 1999). In fact, a Montreal study (Sévigny, 2003) demonstrated that high school drop out is correlated with the index of underprivileged status[2], regardless of sex or national origin.

In the field of Kinesiology, the effect of physical activity participation on self-esteem, self-control, social competence, and attention/concentration has been studied. Varying relationships between sports/physical activity participation and each of these factors which influences learning and, therefore, academic achievement, are reported in the literature. The first contribution to the scientific knowledge base provided by this thesis is a literature review pertaining to the relationships between sports/physical activity participation and academic achievement, social competence, self control, attention/concentration, and self-esteem.

1.2 Physical Activity Promotion

The second contribution to scholarship provided by this thesis is one of physical activity promotion among adolescents, specifically those living in economically impoverished conditions. In order for adolescents to reap the benefits of physical activity

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[2] The data concerning the socio-economic level of the place of residence of students was provided by Statistics Canada and was taken from the 1996 Census of Canada. The underprivileged level of the students' place of residence is derived from the overall index of underprivileged status of Montreal families with at least one child aged 0 to 17. This index was calculated for each one of the 407 school planning units (SPU) into which the Island of Montreal is divided. The SPU's have been classified into ten equal parts (deciles) in descending order. Students are considered to live in a socio-economically disadvantaged environment if their SPU is in one of the first three deciles.

they must practice sufficient daily physical activity. Therefore, it is necessary to understand how to entice adolescents, especially those living in less favourable conditions, to adopt an active lifestyle.

International guidelines stipulate that youth should accumulate an average expenditure of at least 6 kilocalories per kilogram of body weight per day (6+ KKD)[3]. Yet, according to the *2004 Physical Activity Monitor* (*2004 PAM*) (Cameron, Craig, & Paolin, 2005), a mere 27% of Canadian boys and 14% of Canadian girls between the ages of 12 and 19 are meeting these guidelines. Even more disturbing is the research indicating that physical activity levels decline during adolescence, especially among girls (Kimm, Glynn, Kriska, Barton, Kronsberg, *et al.*, 2002; Trost, Pate, Sallis, Freedson, Taylor, *et al.*, 2002). In fact, as stated in the *2004 PAM*, in Canada, 55% of girls and 43% of boys between the ages of 12 and 14 are not active[4] compared to 63% of girls and 45% of boys in the 15 to 19 year old range. Moreover, adolescents in Quebec are the least likely of all other Canadian adolescents to meet the 3+ KKD criterion (Cameron *et al.*, 2005). In fact, according to the *Enquête sociale et de santé auprès des enfants et des adolescents québécois 1999* (Barnett *et al.*, 2002), in Quebec, 61% of 13 year old girls and 57% of 13 year old boys are not

[3] 6+ KKD is equivalent to walking one hour and a half each day (Retrieved December 12, 2006 from http://www.cflri.ca/eng/statistics/surveys/documents/PAM_SPORT_2004.pdf).

[4] A classification of "active" represents an average daily expenditure of at least 3 kilocalories per kilogram of body weight (3+ KKD) during the previous 12 months. For example, an adolescent classified as "active" might walk one hour every day. (Retrieved December 12, 2006 from http://www.cflri.ca/eng/statistics/surveys/documents/PAM_SPORT_2004.pdf).

sufficiently active[5] to reap health benefits. As pertains to 16 year olds, these percentages increase to 69% of girls and 60% of boys. What is more, low income populations are less active than their more advantaged counterparts (Cameron *et al.,* 2005). The decline in physical activity levels during adolescence is consequential because lifestyle habits, such as physical activity, adopted during childhood and adolescence are more likely to be maintained throughout the life span. By the same token, a pattern of physical inactivity acquired at a young age tends to persist into adulthood. [6] In view of these facts, promoting physical activity in teenage populations is essential. While increased physical activity cannot replace the complex web of factors which influence health and academic achievement it remains a promising avenue of intervention as, unlike many societal influences, physical activity is a modifiable lifestyle habit.

It is a truism of health promotion that we must "make the healthy choice the easy choice" (Milio, 1981), and to this end, appealing opportunities must be made readily available. The alarming rate of physical inactivity of youth suggests that we are falling short with regards to physical activity promotion. Social marketing is an approach used which helps to develop physical activity promotion programmes likely to facilitate the voluntary adoption of an active lifestyle[7]. Social marketing has been defined as "a process

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[5] This level of activity is defined, in this study, as daily physical activity and also three weekly periods of 20 minutes of moderate or moderate to vigorous physical activity. (Retrieved December 6, 2006 from http://www.stat.gouv.qc.ca/publications/sante/pdf/enf-ado-4.pdf)

[6] Retrieved December 6, 2006 from http://www.who.int/moveforhealth/advocacy/information_sheets/youth/en/index.html

[7] Retrieved December 1, 2006 from http://www.hc-sc.gc.ca/ahc-asc/activit/marketsoc/tutorial-guide/appendix-annexe_a_e.html

that attempts to create voluntary exchange between a marketing organization and members of a target market based on mutual fulfillment of self-interest" (Maibach, Rothschild, & Novelli, 2002). As such, physical activity programme planners must understand the needs and aspirations of the priority population and offer programmes which satisfy them. Social marketing also emphasizes the importance of identifying subgroups within the priority population and adapting aspects of the promotion programme to each of these subgroups. Furthermore, to influence the adoption of an active lifestyle, all elements of the marketing mix, or the "four P's", must be utilised. In other words, it is necessary to offer a "Product" which includes the priority population's desired outcomes; minimize the "Price", or barriers, perceived by the priority population; offer the product in "Places" which reach the population and fit its lifestyle; "Promote" the product in such a way to maximise the desired outcome, that of increased physical activity. Moreover, physical activity promotion programmes should take into account competitive behaviours, and modify programme components and promotional strategies often, in order to keep up with changing social dynamics.[8]

Another fundamental aspect of health promotion is that individuals are not isolated from the larger social units in which they live, nor are they solely responsible for their health. In fact, physical activity habits are the result of the interaction of many social and environmental factors which are external to the individual. In other words, the settings in which youth live, work, and play, influence their level of physical activity participation.

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[8] Retrieved December 6, 2006 from http://www.social-marketing.org/sm.html

The settings approach in health and physical activity promotion has been gaining ground over the past decade. A key factor behind this approach is the ecological perspective which builds on the "creating supportive environments" strategy of the Ottawa Charter (World Health Organisation, 1986), and has been an underlying theme of subsequent Global Conferences on Health Promotion[9]. According to the ecological perspective, effective interventions are multilevel and multisectoral. As such, programme planning involves assessing the setting and priority population on social, behavioural, environmental, and organisational levels. More precisely, in order to develop adapted physical activity promotion programmes which are liable to effect behavioural change in the priority population, a comprehension of the dynamics of the setting, and the barriers to physical activity, along with the factors which predispose, enable, and reinforce physical activity is necessary.

The school is a promising setting for youth physical activity promotion because the majority of youth spend many hours per week in this environment (Parcel, Kelder, & Basen-Engquist, 2000). Moreover, previous exposure to recreational physical activity through school has been shown to influence adult physical activity across socioeconomic groups (Burton, Turrell, & Oldenburg, 2003). In recent years, school based physical activity promotion interventions have become increasingly popular (Baranowski, Anderson, & Carmack, 1998; Stone, McKenzie, Welk, & Booth, 1998). However, the majority of

[9] Third International Conference on Health Promotion, Sundsvall, Sweden. Theme: Supportive Environments for Health. (Retrieved December 6, 2006 from http://www.who.int/healthpromotion/conferences/previous/ottawa/en/)

studies have focused on modifying the intervention school's physical education programme and, as such, have explored the effects of a compulsory programme on the participants' level of physical activity. Only a handful of studies have examined the effects of non curricular physical activity programmes (Jago & Baranowski, 2004). Cale and Harris (2006), however, point out the merits of the ecological approach and the need to move beyond the curriculum to promote physical activity among youth populations. Moreover, the vast majority of all school based physical activity intervention studies have been designed for elementary school children. Actually, only five studies regarding non curricular, school based physical activity programmes directed towards students in grade 6 or above have been published in peer reviewed journals. What is more, only one of these (Wilson, Evans, Williams, Mixon, Sirard, *et al.*, 2005) focused on the underserved. None has examined a programme based on social marketing among underserved, multiethnic adolescents.

Regarding the population of underserved adolescents, questions which need to be answered include: Is social marketing effective in promoting physical activity among underserved, multiethnic adolescents? Is this approach pertinent to the development of a physical activity programme in which the priority population will want to partake? Is participation in such a school based programme effective for increasing participants' leisure time physical activity outside of school? Does participation in such a programme increase participants' enjoyment of physical activity? Does such a programme reach adolescent girls and boys to the same extent? These questions will be addressed in this thesis through the

presentation of the development, implementation and evaluation of an extracurricular physical activity promotion programme designed for a population of underprivileged multiethnic adolescents.

This thesis is composed of two main sections. The first is a literature review pertaining to the effect of youth sports and physical activity participation on social competence, self control, attention/concentration, self-esteem, and academic achievement. The second section of this thesis is a research article entitled "Physical Activity Promotion among Underserved Youth: "Make it Fun, Easy, and Popular"[10]". As the title suggests, this article describes the development, implementation and results of a physical activity promotion program designed for an underserved population of eighth grade students. The article will be submitted to the journal *Health Education and Behavior.*

[10] Smith, 1999

Chapter 2

Literature Review

2.1 Sports, Physical Activity, and Academic Achievement

Researchers in the physical activity domain have been questioning whether sports/physical activity participation affects the academic performance of children and adolescents since the 1930's (Shephard, 1997). The following review of the literature published between 1995 and 2006, and concerned with the effects of sports/physical activity participation on academic achievement of children and youth, will demonstrate that, still today, the research offers equivocal conclusions. It will be shown that while the cross-sectional research is fairly extensive and often reports positive associations between sports/physical activity participation and academic achievement, and while much of the experimental research, scarce as it is, suggests that sports/physical activity participation may enhance children's (Kindergarten to grade 5) and adolescents' (grades 6 to12)

performance in school, these studies' methodological differences and shortcomings make it difficult to explicitly answer the question: Does participation in sports/physical activity improve the academic achievement of children and youth?

In the following sections, three literature reviews, sixteen cross-sectional studies, and one experimental study identified through keyword (academic achievement, academic performance, scholastic achievement, scholastic performance, educational achievement, school achievement, educational attainment, underachievement, student outcome*, academic*, schol*, physical activity, sport*, athletic*, physical education, youth*, young, child*, adolescent*) searches of selected data bases (ERIC, ISI Web of Science, SPORTDiscus, CINAHL) will be outlined. Subsequent sections will explore whether sports/physical activity participation affects variables which in turn have an impact on academic achievement.

2.1.1 Previous literature reviews regarding the sports/physical activity participation — academic achievement relationship

In a brief review of the literature published between 1980 and 1995 concerning the effects of regular moderate to vigorous physical activity in the school setting on various student outcomes, Keays and Allison (1995) reported that while not all studies revealed significant changes in cognition and academic performance of students who engaged in aerobic activity,

> The positive effects of daily physical activity on student performance and academic achievement in terms of memory, observation, problem solving, decision making, and such specific skills as reading, and mathematics were noted in a number of studies. (p. 64)

However, the authors offer no further elaboration making it difficult to accurately interpret their results. Shephard (1997) reviewed literature, published between 1934 and 1996, dealing with curricular physical activity and academic performance. He found that many cross-sectional studies have found positive associations between various measures of academic success and children's involvement in physical education or school athletics. The methodological details pertaining to the cross-sectional research reviewed, though, are not specified, hence raising many questions. Taras (2005) published a recent, but more restrictive, review covering literature published between 1984 and 2004, and including some studies not covered by either Keays and Allison, or Shephard. His conclusions are nonetheless similar. He points out the paucity of the research dealing with physical activity and academic outcome and cautions that this lack of information should not be considered justification to limit physical education programmes in schools, especially given that there exists some evidence suggesting that the short term cognitive benefits of physical education during the school day compensate for the time physical education detracts from academic subjects.

2.1.2 Cross sectional research findings regarding the sports/physical activity participation — academic achievement relationship

Several cross-sectional studies have been published subsequent to Shephard's 1997 review. Authors found varying results among differing youth populations and using divergent methodologies, making it difficult to draw unequivocal conclusions. Nonetheless, an explicit review of this research corpus is pertinent to this thesis. Studies which found negative and/or no significant associations will first be outlined, followed by those for which positive relationships were documented.

Based on part of the data collected in the Elementary School Climate Study, Tremblay, Inman, & Willms (2000) found a trivial, yet negative, association between volume of physical activity, both in and out of school, and standardised provincial test scores for reading, writing, math, and science among a sample ($n = 5146$) of 6^{th} grade Canadian students. The authors suggest the possibility that, beyond a certain optimal level, physical activity participation may negatively affect academic outcomes. However, given that their measure of physical activity provided only a rudimentary account of the level of involvement of the subjects, nothing further may be concluded.

Drawing on data from the National Educational Longitudinal Study 1988 (NELS: 88), Yin and Moore (2004) analysed a sample of approximately 2000 American youth between the ages of 13 and 18 and found inconsistent results. Standardised cognitive tests in math ($\alpha = 0.90$) and reading ($\alpha = 0.84$) were administered to the students when they

were in grades 8, 10, and 12. The authors' analyses revealed that in grade 8, sports (including marching band and cheerleading) involved youth had significantly lower cognitive test scores than non sports involved youth after controlling for sex, socioeconomic status, and participation in non sports extracurricular activities. By grade 10, there was no significant difference in test scores between the two groups and this result held true in grade 12. Nevertheless, it is not clear whether the students who participated in extracurricular sports in grade 8 were the same students who were participating in these activities in grades 10 and 12. Perhaps younger youth are more apt to participate in sports regardless of their academic competence, whereas older youth who perform less well in school have a tendency to opt out of such activities.

Fletcher, Nickerson, and Wright (2003), for their part, explored the role of structured leisure in the lives of 4^{th} grade children ($n = 147$) and found no significant association between structured leisure activity involvement (as reported by the subjects' parents) and academic achievement. It is noteworthy that for this study the academic achievement variable was based on three indicators: scores for state-wide standardised achievement tests in math and reading, letter grades during the year for each subject, and final year letter grades for each subject. This more robust manner of assessing academic achievement lends credence to these authors' results in comparison to the other research reviewed here so far.

Among a sample of 232 English students ages 13 to 16, Daley and Ryan (2000) found a variety of associations between academic performance and sports/physical activity participation. The indicators of academic achievement used were previous term's letter grades (A-F) for English, math, and science. No significant correlations were found between self-reported physical activity duration, nor weekly frequency of physical activity, and academic performance in the overall sample. Interestingly, further analyses revealed small negative correlations between duration of bouts of exercise and English results among the 13, 14, and 16 year olds. A comparable result was found for science results among 13 year olds. The authors point out that the subjects generally performed well academically and as such had fairly similar grades. Perhaps, had there been greater variability among their academic grades, a more significant relationship would have been observed.

One study not covered in Shephard's review (1997) involved 838 American sixteen year olds. Fisher, Juszczak, and Friedman, (1996) developed a questionnaire covering a list of sports in which the students participated, their level of involvement, and the number of hours per weekday and per weekend day of sports involvement. Participants also reported their grade point average (GPA) on a 5 point letter scale. No specific relationship between any of the aspects of sports involvement and grade point average was found. The manner in which the physical activity variable was constructed is certainly more complete than many of the other studies outlined in this review, yet a weakness lies in the use of self-reported GPA.

Hunt (2005) drew on data regarding the grade 10 cohort (n = 13 152) of the High School and Beyond (HSB) study (National Center for Educational Statistics, 1986). Subjects' participation in athletics as well as self-reported letter grades, were assessed during the 10^{th} and 12^{th} grades. To assess how participation in athletics in grade 10 influences academic outcomes in grade 12, Hunt used a longitudinal design and controlled for variables known to affect academic outcomes (race, sex, socioeconomic status, and attitudinal measures such as self esteem). These analyses yielded no relationship for early participation in athletics on later grades. The author also analysed the data using a longitudinal design, but without controlling for any variables, and found positive associations between athletic participation and academic outcomes. Thus, the author underscores that "different types of analytical designs can yield different results." (p. 439)

While these studies are generally concerned with the same question, and while they report similar results, comparisons and general conclusions may not be made due to the methodological discrepancies. Some of the authors used scores from standardised tests for separate subject matters while others used a composite indicator of achievement. In fact, as has been shown, there is some evidence to support examining the issue for specific subjects, rather than for academic achievement in general. Moreover, the use of letter grade categories rather than a percentage continuum represents a loss of potentially valuable data and may, therefore, mask possible significant relationships. What is more, these studies create speculation around the possible differential effects of various aspects of physical activity, such as frequency and duration, as well as different types of physical activity

involvement, and hence foreground the importance of exploring such aspects separately. With regards to the effects of physical activity participation on youth of different ages, the varying results of the aforementioned studies indicate the importance of studying the impact of physical activity on achievement separately for different age groups. Finally, given that causality may not be determined from cross-sectional studies, longitudinal research designs are more pertinent, however, only if they control for the fact that students who perform better academically are also more likely to be involved in sporting activities. Among the studies reviewed above, only Hunt (2005) took this into account.

The remaining cross-sectional research identified for this review, documents positive associations between various indicators of academic achievement and sports/physical activity participation. Field, Diego, & Sanders (2001) analysed self-report data regarding weekly exercise frequency and GPA (A to D) for 89 American 12^{th} grade students from suburban high schools. The authors used a median split to divide subjects into a low exercise group (29 girls and 24 boys) and a high exercise group (23 girls and 13 boys). Students in the high exercise group reported significantly higher grades than did those in the low exercise category. Several weaknesses of the study are to be noted. First, the actual frequency of physical activity for the low and high exercise groups is not reported. Second, the academic achievement variable was not based on standardised test scores and was reported by the respondents themselves. Third, this variable was reduced to a four point scale; the lack of a continuum represents a loss of potentially valuable data.

Finally, controlling for confounding variables can allow authors to make more informed conclusions from cross-sectional data; however, Field *et al.* merely conducted correlations.

Lindner (1999) conducted a study on a sample of 4690 Chinese students ages seven to eighteen. Sports involvement for the previous academic year was assessed with a questionnaire regarding sports participation (other than physical education), frequency of participation, reason for participating, or not, in sports activities, and desired sports activities. In general, results revealed that subjects who reported being good students, participated significantly more frequently in sports than did those who claimed to be average, below average, or poor students. In addition, self-reported average students participated more in sports than did poor students. When the sample was analysed by sex and by age group, this trend was more pronounced among girls and among the seven to twelve year olds. Notably, among the 13 to 16 year olds, a curvilinear relationship was observed. Both lack of activity and intense daily activity were associated with poor academic performance, and regular, more moderate, exercise was associated with good academic performance. Considering the weakness of the self-report measure of academic performance, Lindner repeated this study three years later (2002) using the same questionnaire, but also taking objective grades into account. This second study involved a sample of 736 boys and 711 girls aged 13, 15, and 17, from six Hong Kong schools categorised as low, average, or high academic performance schools. Analyses revealed that students in the high academic performance schools, who also had significantly higher grades than other students in their school, spent more time engaged in physical activity than

did those students from the more poorly performing schools. A strong point of Lindner's studies is the inclusion of the measure of frequency of participation. Researchers who categorise subjects as either participating or not participating in sporting activities do not account for the regularity of subjects' sports/physical activity involvement.

Drawing on data from The Australian Schools Health and Fitness Survey of 1985, Dwyer, Sallis, Blizzard, Lazarus, and Dean (2001) found a statistically significant and positive association between scholastic performance rating and sports/physical activity participation. A sample of 7000 Australian children between 9 and 15 years old responded to a questionnaire pertaining to, among other variables, their physical activities of the previous week. A representative from each of the 109 participating schools rated the children's scholastic performance on a five point scale ranging from excellent to poor. Results revealed that children with better academic ratings were also more active. Interestingly, the associations between scholastic rating and minutes of weekly activity were weaker, particularly for girls, when time spent traveling to school was added to the total time engaged in physical activities. Perhaps the intensity level of active transport is insufficient to impact scholastic achievement. The authors' results regarding measures of physical fitness and capacity support this tenet as cardiorespiratory endurance, along with muscular force and power, were found to be positively associated with scholastic ratings, however, weakly. Although some variation in the correlations was found for boys and girls of different ages, the trends were similar for these subgroups. The more subjective nature of the academic achievement variable represents a weak point of these authors' study.

Videon (2002) analysed data from the ongoing National Longitudinal Study of Adolescent Health (Add Health) collected between September 1994 and December 1995. A sample of 13 869 American students in grades 7 through 12 were categorised as either participants or not based on self-report data regarding students' participation, or intent to participate, in school sports during the school year. To control for the fact that better students tend to participate in athletics, Videon's statistical technique was to, first, estimate the likelihood that an individual participates in sports and to, second, use this predicted probability as a proxy for self selection. Multivariate analyses results revealed a borderline significant association between sports participation and self-reported grades for the previous term; this effect was greater for boys than for girls. Notwithstanding the fact that Videon controlled for self-selection effects, the analytic design does not allow her to determine the direction of causality. Other methodological pitfalls include the lack of distinction made between types of sports involvement and volume of participation, and the fact subjects of different ages were analysed together rather than separately.

Darling, Caldwell, & Smith, (2005) analysed cross-sectional data collected from a sample of 2462 American youth over a two year period. Based on self-report data, students were categorised as either participants or not. Academic achievement was based on self report data regarding the previous term's grades (four point scale). Based on year two data, subjects who had been involved in sports (including cheerleading) type extracurricular activities (ECA) reported significantly higher grades for the previous term than those who were not involved in any ECA's, yet significantly lower grades than those involved in non-

sports type ECA's. The same trends were observed after controlling for self-reported grades in year one.

Broh (2002) also analysed data from the NELS: 88 for a sample of 12 578 American students in grade 10 and two years later in grade 12. Both school grades and standardised test scores for math and English were used as indicators of academic achievement. The author was concerned with long term sports participation and, as such, the analyses regard subjects who participated in interscholastic sports during both 10^{th} and 12^{th} grades, versus those who did not participate at all. Results revealed that even after controlling for the fact that higher achievers self select into sports, a small but significant positive association remained between participation in interscholastic sports and math and English grades in grade 12. As pertains to the standardised test scores, this result held true for math but not for English. Furthermore, once participation in all other ECA's was controlled for, all the positive associations increased in strength. With regards to cheerleading, no significant association was observed. Interestingly, different results were observed for intramural athletic participation. In fact, there was a significant negative effect between intramural sports and all four academic achievement variables. Moreover, these effects were almost three times larger than the positive effects observed for interscholastic athletes. A strong point of this study is the distinctive analyses for interscholastic athletics, cheerleading, and intramural athletics. The author found that "participation in interscholastic sports creates and intensifies students' social ties, which can be advantageous to students' educational pursuits." Yet, she questions if the effects of sports participation on academics differs by

type of sport, or if the benefits of participation vary by students' characteristics. Her findings incite further investigation.

Jordan (1999) drew on data from the NELS: 88 study regarding a sample of approximately 15 000 youth for whom base line (grade 8) and first follow up (grade 10) data were available. Participation in school sponsored athletics was evaluated based not only on whether or not students participated in team and individual sports, but also on the number of hours per week they engaged in these extracurricular activities. Grade 8 GPA and standardised reading achievement test scores were used as control variables, whereas students' grade 10 scholastic achievement was measured as the mean of reading, math, history, and science standardised NELS: 88 cognitive tests as well as self-reported GPA. According to regression analyses, team and individual sports participation had a significant positive relationship to students' GPA. Notably, slightly higher effect sizes were found for Hispanic students than for African American and for European American students. Moreover, the association between individual sport participation and African American students' GPA was not significant. Similarly, small positive associations were found for sports participation and grade 10 standardised tests scores. Once again, African American students stood out as team sports participation was positively associated with standardised test scores, yet individual sports participation was negatively associated with this variable. Although the author cautions that these results may be explained by the smaller number of African American students present in the sample, the different relationships for different

types of sports and for youths of different ethnic backgrounds are interesting and warrant further investigation.

Eitle and Eitle (2002) drew on data from the NELS: 88. They found varying associations between sports participation and academic achievement for a sample of African American and European American males. The authors used two indicators of academic achievement for grade 10 students: standardised composite test scores for reading and math (n = 4930), and self-reported grades for math, science, English, and history (n = 4951). Regardless of race, 10^{th} grade participation in both football and basketball was found to be negatively associated with the math-reading achievement test score, but no association was found with other sports. As pertains to the overall self-reported grades, no association was found for football, nor for basket ball. Participation in other sports, however, was associated with higher self-reported grades for European Americans, yet lower ones for African Americans. As has been discussed, differing results for team and individual sports (Jordan, 1999) for intramural and interscholastic sports participation (Broh, 2002) have been documented. Now, the results of Eitle and Eitle (2002) complicate the matter further by demonstrating differential results for different team sports. According to the authors, it is conceivable that the negative associations found are due to the fact that males who are less academically inclined turn to sports (especially football and basketball) in the hopes of a future career.

In an effort to advance the comprehension of the parameters of the physical activity—academic achievement relationship, Miller, Melnick, Barnes, Farrell, and Sabo (2005) drew on data from the Longitudinal Family and Adolescent Study (1996) and examined gender and race differences for the impact of either "jock" identity or athlete status on changes in school grades over a two year period. The authors collected data from a random sample of 586 American youth. Subjects were initially surveyed when they were around 14 years of age and a second time two years later. Based on self-report data, participants were either categorised as participating or not participating in school sports. After controlling for gender, race, age, socioeconomic status, and baseline self-reported GPA, athletic participation did not significantly predict self-reported GPA two years later. Gender specific analyses, on the other hand, revealed that female athletes reported higher grades in year two than their less active counterparts. Male athletes, for their part, had somewhat lower grades than males who did not engage in school sports activities. Analyses of the "jock" identity/athlete status variable revealed that, in the complete sample, females who claimed the "jock" label had lower grades in year two than female non jocks. When the analyses were split by race, no significant difference was observed for European American students, but African American students who participated in sports and who also perceived themselves as jocks had significantly lower grades than African American non jocks. Hence, the main contribution of this study is the demonstration that the strength of the association between academic achievement and sports participation is contingent upon

the gender and race of the adolescents as well as how they feel they are perceived by their peers. In fact, these authors provide evidence for deleterious effects of the "jock ethos".

Further possible explanations of the mechanisms underlying the relationship are brought forth by Guest and Schneider (2003). Drawing on data from the Alfred P. Sloan Study of Youth and Social Development (1997) regarding a sample of 2925 10^{th} and 12^{th} grade American students, the authors found a positive association between participating in competitive sports and achieving a higher GPA. However, this relationship was found to be moderated by whether or not the students had an athletic identity as well as by the school context. The authors found that in lower and middle class schools, being perceived as athletic was associated with higher grades, whereas the converse was true in upper class schools and in schools where nearly all students go on to pursue university degrees.

Owing to the varied research designs of these studies, it is difficult to draw general conclusions. Nonetheless, the research outlined above indicates that the relationship between sports/physical activity participation and academic performance is not a simplistic one. Differing results have been found across gender, race and age, as well as for team, individual, intramural, and interscholastic sports. Moreover, varying levels of intensity as well as frequency and duration of participation may impact students differently. Finally, some authors have shown that identity perception moderates the sports/physical activity—academic performance relationship.

2.1.3 Experimental research findings regarding the sports/physical activity participation — academic achievement relationship

There is a dearth of experimental research which focuses on the impact of sports and physical activity participation on the academic achievement of children; no such study focuses on adolescents. It, therefore, remains difficult to draw unequivocal conclusions. Nonetheless, the observed changes in students' academic results can be attributed to the research interventions discussed in this next section.

In his review, Shephard (1997) discusses three longitudinal experimental studies conducted since the 1950s. The first, the Vanves study (Hervet, 1952), was conducted in a suburb of Paris, France in 1950. The students from the experimental school were in their last year of elementary school. Their timetable was altered as follows: the school week was lengthened from 32 hours to 41.5 hours, daily morning and afternoon 30 minute naps were integrated in the schedule, academic instruction was reduced by 26% and limited to mornings, a wide range of required physical activities occupied the students in the afternoons, and finally, students were given regular vitamin supplements. The experimental students were compared to a non randomised sample of students in two other schools. Despite the reduction in academic instruction time, the proportion of students failing the 'certificate of study' was comparable for experimental and control subjects. According to Shephard, there exists no formal publication of this study in an English language journal, thus, making it difficult to judge the validity of this study. What is more, owing to the school day schedule modifications and the administration of vitamins, the results can not be

attributed solely to the increase in physical activity participation. Nevertheless, the similarity of the experimental and control groups' academic outcomes is intriguing.

Shephard also discusses a study (Dwyer, Coonan, Worsley, & Leitch, 1979) conducted almost 30 years later in Australia involving 519 grade 5 children. Participants were randomly allocated to either the fitness, skill, or control group. The fitness group received 15 minutes of physical activity each morning and 60 minutes each afternoon and an emphasis was placed on maintaining an elevated heart rate. The schedule for the skills group was similar, but the emphasis was on developing athletic skills instead. The control group received 30 minutes of physical education per week. Despite the 14% reduction in academic instruction time, there were no significant intergroup differences for gains in math performance or reading skills over the intervention period.

The Trois-Rivères longitudinal study (Shephard, Volle, Lavalée, LaBarre, Jéquier, *et al.*, 1984) is the third and final experimental (but not randomised) study covered in Shephard's review. In total, 546 Canadian students in grades 1 through 6 partook in the programme. The experimental group students participated in one hour of additional physical education each school day, while the control group students received only the standard 40 minute weekly physical education class. The experimental group, therefore, received 13-14% less academic instruction time than the control group students. Academic achievement was based on French (mother tongue), math, English (second language), and natural science grades. Note that these scores were not based on standardised tests. During

the first year, the control students had somewhat better grades, on average, than did the experimental ones. However, in grades 2 through 6 the experimental group outperformed the control group, and significantly so in grades 2, 3, 5, and 6. Furthermore, a greater academic advantage was observed for the girls who participated in the intervention. In the 6^{th} grade, all students were subjected to a provincial standardised exam. While study time for this exam depended on the number of hours the students were in the classroom and while the experimental students spent less time in class, no significant intergroup difference was observed for French results. Also, the experimental group students performed significantly better in math. These students, however, demonstrated a significant disadvantage for English.

Since the publication of Shephard's 1997 review, only Sallis, Mckenzie, Kolody, Lewis, Marshall, & Rosengard, (1999) have contributed to the experimental research in this field. The authors recruited two cohorts of 4^{th} grade American students ($n_1 = 330$, $n_2 = 424$) over two consecutive years to participated in the Sports, Play, and Active Recreation for Kids (SPARK) study. All subjects completed the Metropolitan Achievement tests prior to and following the two year intervention. SPARK is a physical education programme involving 30 minutes of physical activity three days per week during the school year (36 weeks), and a self-management programme which teaches students behaviour change skills to help with generalisation and maintenance of regular physical activity. The seven participating schools were randomly assigned to one of three groups. Students in the 'specialist' schools participated in the SPARK programme led by physical education

specialists. Those in the 'trained teacher' schools also participated in SPARK, but were led by their classroom teacher who had been previously trained to lead the programme. It is worth mentioning that these students spent on average 65 minutes per week in physical education compared to 80 minutes for the specialist group. The remaining control schools subjects received, on average, the standard 40 minute period of weekly physical education given by their regular classroom teacher. With regards to the first cohort, the specialist group's scores increased in percentile ranking for the reading test, and the control group's decreased; this difference was significant. Although all students declined in percentile ranking for the language test, the decline was significantly smaller for the trained teacher group. In the case of the second cohort, the specialist groups' scores were significantly lower in language than those of the control group. Once again, the trained teacher group subjects saw their percentile ranking for the basic battery and reading tests decline less than those students in the other two conditions. As with the other experimental studies, theses results are quite positive in that the increased time spent in physical education and, therefore, less time spent on academic instruction did not hinder students' scholastic achievement. Although one unfavourable result was found for language, it would be hasty to conclude a negative impact of the programme based on this result as it was only present for one of the cohorts. In fact, the programme appears to have attenuated the decline in reading and language achievement in some cases.

Despite the fact that seventeen studies regarding the relationship between sports/physical activity and academic achievement have been conducted over the last

eleven years, generalised conclusions can not be drawn due to methodological discrepancies. In fact, not only does this literature review not answer the question: Does participating in sports/physical activity enhance academic performance? it raises the question: If sports/physical activity participation does enhance academic achievement, what are the causal mechanisms? It would appear that researchers may gain a better understanding of how sports/physical activity participation and academic achievement are associated if they seek to understand the impact of sports and physical activity participation on variables which in turn influence how students perform at school. This will be the focus of the subsequent sections.

2.2 Sports, Physical Activity, and Learning Conditions

Academic achievement is contingent upon a multitude of learning conditions, such as self esteem (Bankston & Zhou, 2002), attention/concentration (King *et al.,* 2005), social competence, and self control (Rouse *et al.*, 2001). Research pertaining to the relationship between sports/physical activity and these four learning conditions will now be reviewed.

2.2.1 Sports, physical activity, and social competence

The effect of sports/physical activity on social competence has not been studied at any great length. In fact, only two cross sectional studies (Fletcher *et al.,* 2003; McHale, Vinden, Bush, Richer, Shaw, *et al.*, 2005) were identified for this review, and they focus specifically on the relationship between structured and supervised sports/physical activity participation and social competence. An essay (Petitpas, & Champagne, 2000) was also

identified and will serve, here, to provide an overview of the subject. These studies were identified by keyword (physical activity, sport*, athletic*, physical education, social competenc*) searches of selected data bases (ERIC, ISI Web of Science, SPORTDiscus and CINAHL), as well as from citations of the articles identified through the keyword search. Articles were restricted to those which were presented in peer reviewed publications since 1995.

In their essay, Petitpas and Champagne (2000) liken sports involvement to a positive gang experience. They contend that sports participation can contribute to social competence since it offers the possibility to interact with one's peers, learn respect for democratic values, and understand responsible citizenship. Yet, they caution that the acquisition of such competencies is contingent upon the context of the sporting experience. Inappropriate comments and feedback from coaches, for example, can have a variety of negative consequences for participants. With respect to adolescents, sports programmes which promote conformity and compliance, rather than fostering exploratory behaviour and leadership, may fail to teach valuable skills which enable youth to cope with life's challenges. What is more, the belief that sports involvement fosters social competence implies that participants will transfer skills they acquire through sports to other areas of their lives. However, according to the authors, youth do not typically understand what skills they have acquired, nor how to use them at school or work.

Fletcher *et al.* (2003) examined the role of structured leisure in the lives of 4th grade children (n = 147). Children's involvement in leisure activities was assessed by parents' responses to the Child Behavior Checklist (Achenbach & Edelbrock, 1981). Teachers rated subjects' social competence using the Social Competence subscale of the Harter Perceived Competence Scale (Harter, 1982). The authors found that children involved in sports teams were more socially competent than those who were not involved in team sports activities. Nevertheless, these results do not indicate whether the children who were involved in sport teams were more socially competent prior to their involvement, or if social skills were acquired through sport involvement.

McHale *et al.* (2005) conducted a similar study. The study sample was a group of ethnically diverse, economically impoverished 7th grade boys (n = 216) and girls (n = 207) from three middle schools in high crime neighbourhoods. Involvement in team sports was determined through interviews with participants whereas social competence was rated by the physical education teachers with an abridged version of the Child Adaptive Behavior Inventory (Cowan & Cowan, 1990). Youth who had been involved in organised team sports during the previous year showed significantly higher levels of social competence than did their less active counterparts. Once again, the study's design does not permit the authors to conclude that greater team sports participation leads to higher levels of social competence.

While a positive relationship between sports involvement and social competence was found for both of the age groups in the studies outlined above, the direction of this

relationship remains unclear. Perhaps organised team sports are activities which attract youth who are more socially competent at the outset. Additionally, both of these studies were concerned with team sports participation, yet the level of competition was not specified. This is significant given that the conflicting results among studies which have explored the relationship between sports/physical activity and indicators of adjustment (such as social competence), for high school and college age participants, may be explained, in part, by the ambiguous definition of sporting activity (McHale *et al.*, 2005). Just as Petitpas and Champagne (2000) suggest, McHale *et al.* propose that team sports involvement may not affect participants in the same way as does general physical activity, nor may aggressive contact sports have the same impact on youth as do non competitive team sports. Future research should, therefore, focus separately on different types of physical activities in order to better understand the sports/physical activity—social competence relationship.

2.2.2 Sports, physical activity, and self-control

The effect of sports/physical activity on self control has rarely been the subject of scientific investigation. In fact, keyword searches (physical activity, sport*, athletic*, physical education, self control, self-regulation) of selected data bases (ERIC, ISI Web of Science, SPORTDiscus and CINAHL) located only three peer reviewed articles regarding healthy children and youth (Gendron, Royer, Bertrand, & Potvin, 2004; Lakes & Hoyt, 2004; Petosa, Hortz, Cardina, & Suminski, 2005) published since 1995.

Gendron *et al.* (2004) examined the sports/physical activity—self control relationship among 12 to 14 year olds. These authors compared behaviourally disordered students (n = 77) with their non-behaviourally disordered counterparts (n = 108). Self control was measured with the French version of Gresham and Elliott's (1990) Self-report Social Skills Rating Scale (SSRS). The authors found that behaviourally disordered students were more likely to participate in non-organised sports activities than were non-behaviourally disordered students. Furthermore, the behaviourally disordered students exhibited significantly lower levels of self control than did the non-behaviourally disordered students. These results do not, however, indicate that participation in organised sports activities leads to better self control. It is possible that those with lower levels of self control are not attracted to organised sports activities.

A second cross-sectional study (Petosa *et al.*, 2005) dealt with a primarily Caucasian sample of 9^{th} and 12^{th} grade students (n = 183 and n = 166 respectively). A range of social cognitive theory variables, including self-control, was measured with a self-report instrument developed by the authors ($\alpha = 0.76$). Frequency, duration, and intensity of physical activities were evaluated during a period of eight consecutive days using the Previous Day Physical Activity Recall (PDPAR). Results indicated a positive linear relationship between self-regulation and number of days of physical activity. Nevertheless, the cross-sectional design of this study precludes the ability to make any causal conclusions about how sports/physical activity and self control are related.

Lakes and Hoyt (2004), for their part, used an experimental design to investigate the effectiveness of a martial arts training programme for promoting self control in a sample of children (n = 193) enrolled in kindergarten through grade 5, at a private elementary school. The experimental group participated in four physical education classes per week, two to three of which consisted of martial arts training. The control group participated in the standard four weekly periods of physical education. Prior to and following the intervention the children's physical, cognitive, and affective self control in response to challenge were evaluated by impartial observers using a scale developed by the authors. Children in the martial arts group scored significantly higher on all three subscales in comparison to those in the control group. This effect was, however, more important among the grades 4 and 5 students. Furthermore, the boys in the martial arts group improved more so than the girls, although this difference was only significant for the cognitive self control subscale. The authors suggest that a differential reaction to the male instructor and to the co-ed nature of the classes could explain the gender difference. While the research design allows the authors to conclude that the intervention had a positive effect on the self control of participants, it remains unclear as to which aspect of the programme was responsible for the improvement. It is important to note that during the martial arts training, the students were required to ask themselves three questions designed to promote self-monitoring: Where am I? What am I doing? What should I be doing? Students would then correct their stances, thoughts, or behaviours accordingly. Consequently, it is possible that the cognitive, rather

than the physical activity, aspect of the programme was responsible for the observed change in self control.

Unfortunately, no conclusions can be drawn from so few studies. Nevertheless, the associations of organised sports participation and frequency of participation with self control as well as the positive effect of the martial arts intervention on this variable, indicate that it may be worth while for future research to examine the sports/physical activity—self control relationship in greater depth. Experimental studies which distinguish between team sports, individual sports, and leisure physical activities, as well as frequency and intensity of sports/physical activity involvement, could help shed some light on what type of sports/physical activity, if any, helps to develop self control in youth.

2.2.3 Sports, physical activity, and attention/concentration

In this section, one review paper (Tomporowski, 2003) and one experimental study (Lakes & Hoyt, 2004) dealing with the effect of sports/physical activity on attention/concentration in children and youth will be reviewed. These articles were identified by keyword (physical activity, sport*, athletic*, physical education, concentration, attention, attention/concentration, youth* young, child* adolescent*) searches of selected data bases (ERIC, ISI Web of Science, SPORTDiscus and CINAHL). Articles were restricted to those published in peer reviewed journals since 1995.

Recently, Tomporowski (2003) reviewed studies published after 1975 and found only four reliable experimental studies which examined the effect of acute physical activity

on concentration levels of children and adolescents. For the most part, these studies were designed in response to the concern that recess and physical education classes overly excite children and may, therefore, have deleterious effects on their classroom behaviour and academic performance. The first study (Gabbard & Barton, 1979), tested the mathematical computation performance of children in the 6^{th} grade (n = 106) before and after 20, 30, 40, and 50 minutes of vigorous physical activity. Their results indicated that the physical activity did not hinder the children's performance. In fact, performance was significantly enhanced following the 50 minute bout of vigorous physical activity. A similar study (McNaughten & Gabbard, 1993) found that mathematical computation speed and accuracy of 6^{th} grade children (n = 120) was not affected by 20, 30, or 40 minute paced morning walks. Performance was significantly higher, however, when assessed midday and in the afternoon. This was particularly so following the 30 and 40 minute walks. Still others (Raviv & Low, 1990), focussed on a sample (n = 96) of 11 and 12 year old students. The youth responded to the d2 Concentration Test (Brickenkamp, 1962) which has a completion time limit and, therefore, measures concentration under stress. Two groups of students received either physical education or science classes in the morning and afternoon and completed the concentration instrument before and after each of these periods. The results of this study indicated that both groups of students showed higher levels of concentration at the end of their respective periods than they did at the beginning. Moreover, students' concentration levels were consistently higher at the end of science class as compared to physical education, though not significantly. While the authors suggest re-examining the

hypothesis that concentration will be lower after physical education classes than after science classes, they conclude that, in their study, physical activity did not impede the youth's ability to concentrate. The final study reviewed by Tomporowski was conducted by Caterino and Polak (1999) and assessed students enrolled in grades 2 through 4 (n = 177) with the Woodcock-Johnson test of Concentration following 15 minutes of vigorous aerobic exercise or 15 minutes of stretching. The concentration of the 2nd and 3rd grade students was not affected by either protocol, but the concentration scores of the 4th grade students improved significantly following the aerobic exercise. These four studies indicate that the effect of sports/physical activity on the attention/concentration levels of students can be positive depending on the frequency and intensity of the exercise, the time of day it is performed, and the age of the participants. While inconclusive, these results certainly indicate that the issue warrants further scientific investigation in order to understand what modalities of sports/physical activity affect the attention/concentration of children and youth.

Since the publication of the aforementioned review paper, Lakes and Hoyt (2004) evaluated the effects of a martial arts training programme on elementary school pupils (n = 193). Children responded to the Wechsler Intelligence Scale for Children-third edition (WISC-III) before and after the intervention and were compared to a control group of children who had not participated in the programme. A significant increase, with a moderate effect size, was observed in the arithmetic subset scores of the experimental group. Interestingly, this physical activity intervention was considerably different from

those interventions described by Tomporowski (2003) yet still had a positive impact on students aged six to eleven. Moreover, the martial arts programme also had a positive effect on the self control of participants. Future research could examine the possible moderating effect of self control in the sports/physical activity—attention/concentration relationship.

Research, though sparse as it is, indicates that there is no cause for concern with regards to vigorous physical activity during the school day and students' ability to concentrate. Results even suggest that physical activity may, in fact, improve children's concentration and perhaps then, their academic performance. Nonetheless, the underlying mechanisms of the association between sports/physical activity and attention/concentration seem to be poorly understood. Researchers should investigate the differential effects of moderate and vigorous physical activity, as well as its frequency, duration, and time frame.

2.2.4 Sports, physical activity, and self-esteem

Although, the impact of sports/physical activity on self-esteem has been the subject of much interest in the literature, there is a paucity of information available regarding child and adolescent populations. In fact, the nature of the association between sports/physical activity and self-esteem remains unclear. The following review will show that while many cross-sectional studies indicate a positive correlation between sports/physical activity and self-esteem for the child and adolescent populations, experimental studies are scarce making it difficult to conclude sports/physical activity contributes to the development of self-esteem in these age groups.

This section will review a series of studies which were identified by keyword (physical activity, sport*, athletic* physical education, self-esteem, youth*, young, child*, adolescent*) searches of selected data bases (ERIC, ISI Web of Science, SPORTDiscus and CINAHL). Articles were restricted to studies that were presented in peer reviewed publications between 1995 and 2006.

In a recent paper, Fox (2000) summarised his findings from a comprehensive review based on thirty-seven randomised and forty-two non randomised controlled studies concerned with the effects of sports/physical activity participation on self-esteem in a variety of age groups. According to the author, this particular body of literature, "is best summarised as a pitifully small number of well designed studies that have used outdated and limited instrumentation." Nevertheless, his review revealed that about half the studies showed that physical activity brought about a change in global self-esteem and three quarters of the existing work indicated significant changes in the more specific domain of physical self-esteem. More precisely, positive associations were noted in both male and female subjects, with the greater improvement in self-esteem found in children and middle aged adults. In addition, as is often hypothesised, the author found that those who begin an exercise programme with low self-esteem or in poor physical condition are those who will experience the greatest improvement in self-esteem as a result of the additional physical activity. Yet another of his findings is that several types of exercises can be effective in improving self-esteem of participants, but most of the evidence lends support to the tenet that aerobic and weight training exercises produce the greatest effects. Actually, according

to this review, weight training is the most effective type of exercise over the short term. Although the different outcomes between different types of physical activities are interesting, to view diverse activities as separate and specific variables is perhaps a limited perspective. It is likely that the benefits of sport/physical activity participation depend on the aspirations, or anticipated benefits, of the participants, as opposed to the activity in and of itself. With respect to the length of interventions, Fox found that for the exercise programme to be effective in increasing global self-esteem it, "should last at least twelve weeks, with some form of contact continuing for six months or more." Given that the author found physical activity to have a greater affect on the more specific construct of physical self perception, he concludes by suggesting that future research focus on domain specific self-esteem rather than global self-esteem.

Nine cross-sectional studies exploring the sports/physical activity—self-esteem relationship for children and adolescents have been published since Fox's review. Among them, two investigated the relationship for the pre-adolescent age group (Parfitt & Eston, 2005; Tremblay *et al.,* 2000) while others were concerned with the early adolescent (McHale *et al.*, 2005) and adolescent (Kirkcaldy, Shephard, & Siefen, 2002; Yin & Moore, 2004) age groups. Still others explored how the relationship operates across race (Erkut & Tracy, 2002; Tracy & Erkut, 2002) and gender (Bowker, Gadbois, & Cornock, 2003; Dunton, Schneider, Graham, & Cooper, 2006; Richman & Shaffer, 2000).

Parfitt and Eston (2005) selected a sample of 35 girls and 35 boys (mean age = 10.4 ± 0.4 years) from three elementary schools in North Wales. Pedometers were used in order to measure the level of physical activity of the participants. Students wore the step counters from the time they awoke in the morning until they went to bed at night, for a period of seven consecutive days. The sum of the seven days was used as the measure of habitual physical activity. Global self-esteem was evaluated with six items from The Child and Youth Physical Self-perception Profile (developed from Fox & Corbin, 1989 and Harter, 1985) ($\alpha = 0.77$). The level of physical activity did not differ between male and female subjects, and significant positive correlations between physical activity and self-esteem were present for both sexes.

Similar results were found in a larger sample of sixth grade pupils (n = 5146) in New Brunswick, Canada (Tremblay *et al.,* 2000). The Elementary School Climate Study (1996) examined, among other variables, global self-esteem using 16 items from the Self Description Questionnaire (Marsh & O'Neill, 1984) ($\alpha = 0.88$), and regular physical activity participation both in and out of school. Regression analyses revealed that females had lower self-esteem than males. However, when physical activity level was added to the regression model, this variable was found to be significantly associated with self-esteem, and more interestingly, the gender difference in self-esteem disappeared. According to this study, therefore, young girls who are physically active are less likely to experience low levels of self-esteem.

McHale *et al.* (2005) studied a sample of twelve to thirteen year old youths, comparing those who had participated in adult-supervised organised team-sports during the previous year (n = 178) with those who had not (n = 195). Global self-esteem was assessed by subjects' responses to a selection of twenty-four items from the Self-esteem Questionnaire (Dubois, Felner, Brand, Phillips, & Lease, 1996) ($\alpha = 0.87$). Results indicated that while boys (n = 216) reported significantly higher levels of self-esteem than did the girls (n = 207), all those who had been involved in adult-supervised organised team sports during the previous year showed evidence of significantly higher levels of self-esteem than did their less active peers. Although these findings support those of Tremblay *et al.* discussed above, they do not necessarily suggest that physical activity involvement causes gains in self-esteem.

With regards to self-reported frequency of involvement in endurance sports (both team and individual), Kirkcaldy *et al.* (2002) found a positive and significant correlation with self esteem among youth with a mean age of 15.6 ± 0.8 years. The sample consisted of 477 male and 511 female pupils from nine high schools in a semi-rural region in West Germany. Self-esteem was assessed, among other variables, with an instrument which had previously been developed for a nation wide survey of German adolescents. Significantly higher levels of self-esteem were found in subjects who reported frequent participation in endurance sports in comparison to those who reported participating in endurance sports often, seldom or never.

Drawing on data from the National Educational Longitudinal Study 1988 (NELS: 88), Yin and Moore (2004) analysed a nationally representative sample of approximately 2000 youth. Participants' self-esteem was measured in grades 8, 10, and 12 with a self-report instrument developed specifically for the NESLS: 88 ($\alpha = 0.79$). Students were also surveyed at these times regarding their involvement in extracurricular sports activities. It is worth mentioning that the authors considered cheerleading and marching band as sports activities due to their athletic demands and competitive natures. While the sports involved youth had significantly higher self-esteem at base line in grade 8, and this difference, though smaller, remained in grade 10, no significant difference between those who were involved in sports and those who were not, was present in grade 12. The longitudinal design of this study is interesting as it shows the progression of the association between physical activity and self esteem during adolescence. The observed decrease with age is indeed intriguing and warrants further exploration. Furthermore, consistent with the four other studies reviewed here, significant positive associations were found between sports/physical activity and self esteem for youth in grades 8 and 10. On the other hand, none of the investigators had the same conception of physical activity. Parfitt and Eston (2005) measured habitual physical activity mechanically, whereas Tremblay *et al.* (2000) used a self-report instrument. McHale *et al.* (2005) focussed on organised team sports involvement, yet Yin and Moore considered involvement in a variety of physically demanding extracurricular activities. Moreover, Kirkcaldy *et al.* (2002) used frequency of participation in endurance sports as their measurement of physical activity. Given these

fundamental differences in the studies' designs, further comparisons of the results are not possible.

In a retrospective study, Richman and Shaffer (2000) examined the associations between girls' (n = 220) self-report pre-college sports participation and their present college global self-esteem. According to results, pre-college sports participation is positively and significantly associated with later college self-esteem inasmuch as it is also associated with positive body image, physical competence, masculine attributes, and academic competence. It is noteworthy that body image and physical competence are both components of physical self esteem and, therefore, it is possible, that global self esteem increased due to the increase in physical self esteem.

The most recent investigation of the effects of sports/physical activity on the self esteem of youth was conducted by Dunton *et al.* (2006) and involved 103 adolescent females aged fourteen to seventeen, from upper-middle class suburban communities. The authors recruited forty girls who reported practicing 60 minutes or more of vigorous physical activity per day, and sixty-three sedentary girls. ('Sedentary' was defined as practicing less than three bouts of twenty minutes of vigorous activity, and less than five bouts of thirty minutes of moderate activity per week.) To assess physical self-esteem, the authors administered the self-report Physical Self Description Questionnaire (PSDQ) (Marsh, Richards, Johnson, Roche, & Tremayne, 1994), an instrument measuring such specific self-concept domains as perceived flexibility, body leanness, and sports

competence. Peak oxygen consumption was used as a measure of cardiovascular fitness and level of physical activity was assessed with the self-report 3 Day Physical Activity Recall (3DPAR), an instrument which converts reported activities into METs. Results showed no association between moderate METs and physical self-esteem, but vigorous METs were associated with all but one (perceived flexibility) of the PSDQ sales. However, these bivariate associations disappeared when the independent effects of physical activity on self-esteem were studied with multiple regression analyses. Furthermore, peak oxygen consumption was associated with all the self-esteem domains and percent body fat was negatively associated with all scales except body leanness. Therefore, these results indicate that physical self-esteem is more closely related to physical fitness characteristics than to physical activity. It would appear that in order for teenage girls' self-esteem to improve through physical activity, participants must reap physical benefits from the exercise programme.

Concerned with the influence of school *and* community sport participation on self-esteem, Bowker *et al.* (2003) go one step farther by investigating the effect gender role orientation (and not just gender) has on the relationship. One hundred grade 11 students from two middle class Canadian high schools volunteered to partake in the study. Results indicated that subjects with a low feminine gender role orientation score who participated in competitive sports exhibited higher levels of athletic competence (an aspect of physical self-esteem) and global self-esteem. Moreover, individuals with a high feminine gender role orientation score demonstrated higher levels of global self-esteem the longer they were

involved in non-competitive sports. Hence, the authors' results suggest that sports participation does predict self-esteem but this relationship is moderated by gender role orientation (as opposed to gender) and the degree to which the participation is competitive.

In an attempt to understand what, if any, variables mediate the sports/physical activity—self-esteem connection, Tracy and Erkut (2002) and Erkut and Tracy (2002) analysed data from the National Longitudinal Study of Adolescent Health (ADD health, 1994 - 1996). The authors' initial analyses dealt with four samples of students in grades 7 through 12: Caucasian girls (n = 18 078) Caucasian boys (n = 17 566), African American girls (n = 4653), and African American boys (n = 3535). According to the self-report data, subjects were classed as either participating in school sports or not. Global self-esteem was measured with six items from the Rosenberg self-esteem scale (1965) ($\alpha = 0.86$). While a statistically significant correlation between sports participation and self-esteem was found for all four sub-groups, the correlations were highest among male subjects. The authors also found this association to be significantly mediated by school attachment and physical well-being in all subjects. In fact, with regards to Caucasian females, the association was only significant when it was also associated with higher levels of school attachment and a good sense of physical well-being. In a second study the authors compared their results with data for Latino subjects in grades 7 through 12 (Mexican decent: n = 3011, Puerto Rican decent: n = 831, and Cuban decent: n = 800). Sports participation was shown to predict self-esteem among Mexican girls, Mexican boys, Puerto Rican girls, and Cuban boys, in ascending order of importance. Moreover, in these four subgroups, the relationship between school

sports participation and self-esteem was once again mediated by school attachment and physical well-being, though this effect was more important among males than females. A weakness of these two studies lies in the fact that school sports participation was reduced to a dichotomous variable; the effects of different types of sports, and of frequency and intensity of participation were not assessed.

These studies are encouraging insofar as they indicate a positive relationship between sports/physical activity and self-esteem for individuals between eight and fifteen years of age, and from different racial/ethnic backgrounds. Furthermore, the association holds true for team and individual sports, in and out of school. While it would appear that the strength of the association decreases towards the end of adolescence, additional investigations, which employ equivalent measures of physical activity, are needed to better delineate the relationship. Another intriguing finding is that the relationship between sports/physical activity and self-esteem is mediated by school attachment and physical well-being (Tracy & Erkut, 2002; Erkut & Tracy, 2002). Future research regarding mediating variables could help clarify the relationship further. Finally, although some authors conclude the connection is moderated by various factors, the cross sectional designs are limiting as the direction of the relationship can not be determined. It is feasible that, rather than physical activity participation leading to improved self-esteem, young people's confidence to participate in sports stems from high levels of self-esteem.

Five experimental studies will now be reviewed in an attempt to shed some light on the nature of the sports/physical activity—self-esteem association. Results regarding preadolescents (Annesi, 2005; Ignico, Richhart, & Wayda, 1999; Lakes & Hoyt, 2004), adolescents from a low income neighbourhood (Bonhauser, Fernandez, Puschel, Yanez, Montero, *et al.*, 2005), and girls aged nine to sixteen (Boyd & Hrycaiko, 1997), will be presented.

The previously described study evaluating the impacts of a martial arts intervention (Lakes & Hoyt, 2004) on self control also measured the effect of participation in the intervention on the self esteem of the subjects. In this study, the experimental group participated in four physical education classes per week (two to three of which consisted of martial arts training) whereas the control group participated in the standard four weekly periods of physical education. Prior to and following the intervention, the self esteem of sixty-six grade 4 students was assessed with The Coopersmith (1967) Self-Esteem Inventory. Results indicate no significant difference in self-esteem between the control and intervention groups. This may be understandable given that the intervention's focus was on developing self-control through martial arts training.

Similar results were found by Ignico *et al.* (1999) who explored the effects of an after school physical activity programme in a comparable age group. Twelve girls and nine boys between ages eight and eleven were selected in such a way as to include an equivalent number of boys and girls from various socioeconomic backgrounds. Children with a low

fitness level were recruited as it was assumed they would benefit the most from the programme. The after-school intervention consisted of one hour of activities, three days per week for a period of ten weeks. During the first and tenth weeks, subjects were evaluated for aerobic endurance (one-mile walk/run), abdominal muscular strength an endurance (one minute sit-ups), and flexibility (sit and reach). Participants' self-esteem was assessed during these same time periods using the self-esteem self-report subscale from the Student Self-Concept Scale (SSCS) (Gresham, Elliott, & Evans-Fernandez, 1993). Weeks two through nine focussed on aerobic conditioning, and muscular strength and endurance activities. Additionally, at the start of each of these eight weeks, a sport psychologist spent ten minutes discussing a specific concept of self-esteem. These themes were then incorporated into the after-school activities. Despite the fact that participants showed significant improvements for all fitness parameters measured, self-esteem scores changed little over the intervention period. It is noteworthy that all participants began the programme with either average or high levels of self-esteem and as Fox (2000) notes, those who begin with low self-esteem are more apt to improve than are those who begin with a high level of self-esteem. Further, the intervention lasted only ten weeks, which, according to Fox, is insufficient to effect a change in this dependant variable.

Interestingly, in a sample of similar aged children, a twelve week structured physical activity after-school programme produced more favourable results (Annesi, 2005). An equivalent number boys and girls between the ages of nine and twelve, and from diverse ethnic/racial backgrounds (60% African American, 29% European American, 11% other)

were divided into five experimental groups (total n = 50) and four control groups (total n = 42), each with its own instructor. All experimental groups participated in the after-school programme which consisted of academic work and structured physical activity. The physical activity involved forty-five minutes of non competitive tasks and games of varied intensities, resistance exercises, and stretching, three days per week. A behavioural skills training component was also included with the hopes of increasing physical activity in the long term. Pupils in the control groups participated in a similar academic after-school programme including only brief periods of unstructured physical activity. Prior to and following the intervention, students' physical self esteem was assessed with The Tennessee Self-Concept Scale: 2 Child Form subscale of Physical Self-concept (Fitts & Warren, 1996), and their general self-esteem was evaluated with The Self-Description Questionnaire—I General Self subscale (Marsh, 1988). Results indicated that, contrary to the control groups whose self-esteem did not improve, the experimental groups improved significantly in both physical and global self-esteem.

Bonhauser *et al.* (2005) investigated the case of older adolescents in a low socioeconomic area in Santiago, Chile. Four 9th grade classes were selected randomly from the six possible classes of an urban high school. Among these classes, two were randomly selected as control (n = 100), and two as experimental (n = 98) groups. The school based intervention was developed with the help of the community, the school authorities, the teachers, and the pupils. Over the course of the school year, participation in three 90 minute physical education classes each week was mandatory for the experimental group. Each of

these classes included stretching, dynamic weight transfer exercises, and physical activities. Boys and girls participated separately in four activities of their choice, each of which was practiced for a ten week period. The control group participated in the standard weekly 90 minute physical education class. Prior to and following the intervention, all subjects were assessed with regards to regular physical activity outside of school, maximum oxygen consumption, anaerobic capacity, muscular strength, and self-esteem (Tennessee Self-Concept Scale (Castlebury & Durham, 1997). Results indicated that, as with Ignico *et al.* (1999), subjects in the experimental group showed significant improvements concerning all physical fitness indicators. In contrast to the results of Ignico *et al.* though, this group's self-esteem did improve significantly.

A final study by Boyd and Hrycaiko (1997) focused on a sample of girls, and investigated the effects of a six-week physical activity intervention package on the self-esteem of 181 students aged nine to sixteen. One class from each grade was selected as a control group wile the other participated in the intervention. The six week physical activity programme took place during the regular scheduled physical education classes. Participants in grades 4 and 5 received nine 40 minute classes and those in grades 7 through 10 received twelve. The intervention included three components: physical activity, education, and self-report. The physical activity component consisted of a non competitive programme which focussed on improving self-image by increasing girls' ability, muscular strength and endurance, cardiovascular fitness, agility, and flexibility. The goal of the educational component was to develop a positive physical self-image by teaching the girls the benefits

of muscular strength, flexibility, cardiovascular endurance, agility, and a physically active lifestyle. The programme for the girls in grades 7 through 10 included education regarding weight management through exercise and good nutrition, the definition of beauty and how it relates to body image, and female athletes as positive role models. The self-report component required participants to keep a log book and was designed to increase girls' awareness of their physical strengths and weaknesses, to help them recognise and underscore their accomplishments, and to help them focus on the objectives of the activities. Subjects' global self-esteem was evaluated both prior to and following the intervention using the Self Description Questionnaire (SDQ I for pre-adolescents; $\alpha = 0.82$ or SDQ II for early and middle adolescents) (Marsh, 1988; Marsh, 1990). This multidimensional measure of global self-esteem includes subscales which measure physical self-esteem. While changes in global self-esteem were not observed in any of the age groups, results did indicate that the intervention had had a positive and statistically significant effect on the physical self-esteem of the preadolescent (grades 4 and 5) and the early adolescent (grades 7 and 8) girls.

Given the research designs, the positive change in self-esteem observed in these studies can be attributed to the physical activity programmes implemented in the schools. On the other hand, given the educational and awareness components of some of the programmes, it is not possible to conclude that physical activity alone was responsible for the improvements in self-esteem. With respect to this, a strong point of the studies conducted by Ignico *et al.* (1999) and Bonhauser *et al.* (2005) is the evaluation of

physiological indicators of physical condition. Such a protocol may enable researchers to learn if a certain improvement in fitness level is necessary in order to improve self-esteem. Moreover, it is interesting to note that the two studies which produced positive results on the global self-esteem variable lasted twelve weeks or more and, as Fox (2000) found, twelve weeks would appear to be the minimum length of intervention needed to provoke an improvement in self-esteem. On the other hand, while Boyd and Hrycaiko (1997) did not observe a change in global self-esteem after their six week intervention, they did observe an improvement in physical self-esteem. This lends support to Fox's conclusion that it is more revealing to study self-esteem at a domain specific level rather that at a global level. Finally, as mentioned at the beginning of this section, it would be interesting to explore the role the desired benefits of sport/physical activity involvement play in the sports/physical activity—self-esteem relationship. Perhaps increased self-esteem is not contingent upon the type of sport/physical activity, or improvements in fitness level or physical attributes, but rather upon whether participants achieve the outcomes they seek from their involvement in sports/physical activity.

2.3 Physical Activity Promotion

While sports/physical activity participation may have an effect on various factors which influence learning, and hence, on academic achievement, youth must participate in sufficient sports/physical activity if they are to experience any benefits. As has been discussed, today's youth are not meeting international guidelines for physical activity,

implying a great need for physical activity promotion in this population. To this end, school based physical activity promotion interventions have become increasingly popular in recent years, but most have focused on modifying the physical education curriculum, and few programmes have been designed for middle or high school students (Baranowski *et al.*, 1998; Stone *et al.*, 1998). Given that physical education competes for time with academic subjects, non curricular approaches to physical activity promotion in adolescents may hold promise (Jago *et al.*, 2004). In the following section, school based, non curricular, physical activity programmes designed for adolescents will be reviewed. This research corpus includes one literature review and four studies identified through keyword searches (physical activit*, sport*, athletic*, physical education, intervention*, adolescen*, youth*, health promotion, promot*) in selected data bases (ERIC, ISI Web of Science, SPORTDiscus, CINAHL).

2.3.1 School based non curricular physical activity programmes designed for adolescents

Jago and Baranowski (2004) reviewed the literature pertaining to non curricular[11] approaches to increasing physical activity among children and adolescents, published between 1970 and 2002. These authors identified no more than nine studies evaluating the effectiveness of school based non curricular physical activity promotion programmes, the first of which was published in 1995 (Connolly & McKenzie, 1995). What is more, only

[11] Non curricular was defined as not focusing on school physical or health education.

the 'Middle School Physical Activity and Nutrition' (M-SPAN) study (McKenzie, Sallis, Prochaska, Conway, Marshall, *et al.*, 2004; Sallis, McKenzie, Conway, Elder, Prochaska, *et al.*, 2003) focused on adolescents. This two year randomized control trial was implemented in twelve middle schools (grades 6 to 8) with an average enrolment of 1109 ± 356 students. M-SPAN was based on a structural, ecological model of health behaviour. One goal of the programme was to promote physical activity before and after school, and during the lunch period. The strategies used entailed making activity equipment available to students and recruiting volunteer physical activity providers from the community who in turn, recruited students. Promotional means consisted of announcing physical activity programmes by flyers, school bulletins, parent newsletters, and PTA meetings. Also, student health committees were formed in many of the intervention schools and members received T-shirts and training booklets on how to promote healthful choices. Leisure time physical activity was assessed via the System for Observing Play and Leisure Activity of Youth (SOPLAY) method (McKenzie, Marshall, Sallis, & Conway, 2000). When compared to students in the twelve control schools, an increase in activity both in and out of the physical education was observed for the boys in the intervention schools, whereas girls mainly increased their activity within the physical education class. The authors note that an effort was made to offer activities which were believed to be attractive to girls and which were led mainly by women, but was insufficient.

Since the publication of Jago and Baranowski's review (2004), four other non

curricular physical activity promotion interventions designed for middle and high school students have been undertaken. The first is the 'Students and Parents Actively Involved in Being Fit' (Engels, Gretebeck, Gretebeck, & Jimenez, 2005) after school programme designed for African Americans in an inner city middle school students (n = 56). The intervention was based on a variety of social, cognitive, and behavioural strategies, and consisted of four 60-75 minute supervised physical activities each week. Promotional means included educational handouts, thematic poster boards, and a motivational speaker. Participants were assessed pre and post intervention with regards to Body Mass Index (BMI), percent body fat, resting blood pressure, and walk/run time. Improvements were observed only for blood pressure. Notably, this intervention also focused on fostering healthful diets. Consequently, results are not solely attributable to the physical activity programme. Moreover, the authors did not measure participants' level of physical activity, precluding an evaluation of the programme in this regard.

Wilson *et al.* (2005) used a quasi experimental design to study the effects of an innovative intervention designed to increase the physical activity levels of underserved youth. Grade 6 students (n = 28) from the intervention school volunteered to participate in the programme and were compared to students (n = 20) from the control school. The intervention was based on social cognitive and self-determination theories. Participants took ownership in developing the programme by choosing the activities, and helping with the development of the name and motto of the programme, and also promotional ideas. The four week after school programme was offered three days per week and included one hour

of moderate to vigorous physical activity and a thirty minute motivational component designed to help participants increase their physical activity with friends and at home. Physical activity was measured with accelerometers for five consecutive weekdays, and participants responded to a physical activity enjoyment scale (Kendzierski & Decarlo, 1991) prior to and following the intervention. Intervention students demonstrated a greater increase in average daily moderate, moderate to vigorous and vigorous physical activity as compared to the control group students. No significant results were observed for physical activity enjoyment. This study provides preliminary support for using participant centred interventions to promote physical activity among underprivileged middle school students.

Preliminary results from the 'Intervention Centred on Adolescents Physical Activity and Sedentary Behaviour' (ICAPS) (Simon, Wagner, DiVita, Rauscher, Klein-Platat, *et al.*, 2004; Simon, Wagner, Platat, Arveiler, Schweitzer, *et al.*, 2006) indicate a positive programme effect on physical activity levels of boys and girls. ICAPS is an ongoing four year randomised experimental study. Participants include intervention (n = 475) and control (n = 479) students from eight middle schools in France from a broad range of socioeconomic contexts. This multilevel programme provides physical activity opportunities during lunch and recess breaks, and also after school. The activities take barriers to being active into account and focus on fun, well-being, social aspects of participation, and an absence of competition. Physical activity participation was assessed with a modified version of the Modifiable Activity Questionnaire for Adolescents (MAQ) (Pereira, Fitzgerald, Gregg, Joswiak, Ryan, *et al.*, 1997). It is worth noting that

participation in ICAPS activities was included in this measure. Six months following the start of the intervention, authors observed about 50% of students participated in at least one weekly activity. Moreover, participants included equivalent numbers of students who did and did not practice leisure time physical activity prior to ICAPS. Notably, a significantly higher proportion of girls chose to take part.

The 'Trial of Activity for Adolescent Girls' (TAAG) (Gittelsohn, Steckler, Johnson, Pratt, Grieser, *et al.*, 2006; Stevens, Murray, Catellier, Hannan, Lytele, *et al.*, 2005; Staten, Birnbaum, Jobe, & Elder, 2006) was a two-year randomized field trial which was implemented in eighteen American middle schools (grades 6 to 8). Based on a combination of social-ecological and social marketing approaches, the year round programme offered structured and unstructured physical activity opportunities on and off the school grounds with the goal of reducing the decline in physical activity in adolescent girls. The promotional campaign was based on audience segmentation and emphasized fun and social aspects of moderate to vigorous physical activity (Moe, Pickrel, McKenzie, Strikmiller, Coombs, *et al.*, 2006; Staten *et al.*, 2006). The implementation phase ended in the spring of 2006. Results of girls in the intervention schools will be compared to those from the 18 control schools.

The above review pertaining to school based, non curricular youth physical activity programmes indicates that developing programmes which are based on fun, centered on the population, and take into account barriers to being active can have a positive effect on the

physical activity participation of adolescents. Further, it demonstrates not only a dearth of research results regarding non curricular physical activity promotion among teenagers, but also a need for physical activity promotion research pertaining to underserved adolescents.

References

Achenbach, T., & Edelbrock, C. (1981). Behavioral problems and competencies reported by parents of normal and disturbed children aged 4 through 16. *Monographs of the Society for Research on Child Development,* 46 (10, Serial no. 18).

Annesi, J. J. (2005). Improvements in self-concept associated with reductions in negative mood in preadolescents enrolled in an after-school physical activity program. *Psychological Reports,* 97, 2, 400-404.

Bankston, C. L., & Zhou, M. (2002). Being well vs. doing well: Self-esteem and school performance among immigrant and nonimmigrant racial and ethnic groups. *International Migration Review,* 36, 2, 389-415.

Baranowski, T., Anderson, C., & Carmack, C. (1998). Mediating variable framework in physical activity interventions - How are we doing? How might we do better? *American Journal of Preventive Medicine,* 15, 4, 266-297.

Barnett, T. A., Hamel, L., & Ferland, L. (2002). "Activité physique." In Enquête sociale et de santé auprès des enfants et des adolescents québécois. Retrieved November 10, 2006, from http://www.stat.gouv.qc.ca/publications/sante/pdf/enf-ado-4.pdf.

Bonhauser, M., Fernandez, G., Puschel, K., Yanez, F., Montero, J., Thompson, B., & Coronado, G. (2005). Improving physical fitness and emotional well-being in

adolescents of low socioeconomic status in Chile: Results of a school-based controlled trial. *Health Promotion International,* 20, 2, 113-122.

Bowker, A., Gadbois, S., & Cornock, B. (2003). Sports participation and self-esteem: variations as a function of gender and gender role orientation. *Sex Roles,* 49, 1-2, 47-58.

Boyd, K. R., & Hrycaiko, D. W. (1997). The effect of a physical activity intervention package on the self-esteem of pre-adolescent and adolescent females. *Adolescence,* 32, 127, 693-708.

Brickenkamp, R. (1962). *Test d2, Aufmerksamkeits-Belastungs Test. (4. Auflage)* Hogrefe, Göttingen.

Broh, B. A. (2002). Linking extracurricular programming to academic achievement: Who benefits and why? *Sociology of Education,* 75, 1, 69-95.

Burton, N. W., Turrell, G., & Oldenburg, B. (2003). Participation in recreational physical activity: Why do socioeconomic groups differ? *Health Education & Behavior,* 30, 2, 225-244.

Cale, L., & Harris, J. (2006). School-based physical activity interventions: Effectiveness, trends, issues, implications and recommendations for practice. *Sport Education and Society,* 11, 4, 401-420.

Cameron, C., Craig, C., & Paolin, S. (2005). "Local opportunities for physical activity and sport: Trends from 1999-2004." Retrieved December 6, 2006, from http://www.cflri.ca/eng/statistics/surveys/pam2004.php.

Castlebury, F. D., & Durham, T. W. (1997). The MMPI-2 GM and GF Scales as measures of psychological well-being. *Journal of Clinical Psychology,* 53, 8, 879-893.

Caterino, M. C., & Polak, E. D. (1999). Effects of two types of activity on the performance of second-, third-, and fourth-grade students on a test of concentration. *Perceptual and Motor Skills,* 89, 1, 245-248.

Connolly, P., & McKenzie, T. L. (1995). Effects of a games intervention on the physical activity levels of children at recess. *Research Quarterly for Exercise and Sport,* 66, A60.

Coopersmith, S. (1967). The Antecedents of Self-Esteem. San Francisco, CA: W.H. Freeman & Company.

Cowan, P. A., & Cowan, C. P. (1990). Becoming a family: Research and intervention. In I.E. Sigel, & Brody, G.H. (Eds). *Methods of family research: Biographies of research projects:Vol. 1. Normal families* (p. 1-51), Hillsdale, NJ., Lawrence Erlbaum Associates, Inc.

Daley, A. J., & Ryan, J. (2000). Academic performance and participation in physical activity by secondary school adolescents. *Perceptual and Motor Skills,* 91, 2, 531-534.

Darling, N., Caldwell, L. L., & Smith, R. (2005). Participation in school-based extracurricular activities and adolescent adjustment. *Journal of Leisure Research,* 37, 1, 51-76.

Dubois, D. L., Felner, R. D., Brand, S., Phillips, R. S., & Lease, A. M. (1996). Early adolescent self-esteem: A developmental-ecological framework and assessment strategy. *Journal of Research on Adolescence,* 6, 4, 543-579.

Dunton, G. F., Schneider, M., Graham, D. J., & Cooper, D. M. (2006). Physical activity, fitness, and physical self-concept in adolescent females. *Pediatric Exercise Science,* 18, 2, 240-251.

Dwyer, T., Coonan, W. E., Worsley, L. A., & Leitch, D. R. (1979). An assessment of the effects of two physical activity programs on coronary heart disease risk factors in primary school children. *Community Health Studies,* 3, 3, 196-202.

Dwyer, T., Sallis, J. F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science,* 13, 3, 225-237.

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Murphy, B. C., Holgren, R., Maszk, P., & Losoya, S. (1997). The relations of regulation and emotionality to resiliency and competent social functioning in elementary school children. *Child Development,* 68, 2, 295–311.

Eitle, T. M., & Eitle, D. J. (2002). Race, cultural capital, and the educational effects of participation in sports. *Sociology of Education,* 75, 2, 123-146.

Engels, H. J., Gretebeck, R. J., Gretebeck, K. A., & Jimenez, L. (2005). Promoting healthful diets and exercise: Efficacy of a 12-week after-school program in urban African Americans. *Journal of the American Dietetic Association,* 105, 3, 455-459.

Erkut, S., & Tracy, A. J. (2002). Predicting adolescent self-esteem from participation in school sports among Latino subgroups. *Hispanic Journal of Behavioral Sciences,* 24, 4, 409-429.

Field, T., Diego, M., & Sanders, C. E. (2001). Exercise is positively related to adolescents' relationships and academics. *Adolescence,* 36, 141, 105-110.

Fisher, M., Juszczak, L., & Friedman, S. B. (1996). Sports participation in an urban high school: Academic and psychologic correlates. *Journal of Adolescent Health,* 18, 5, 329-334.

Fitts, W. H., & Warren, W. I. (1996). *Tennessee Self-concept Scale manual. (2nd ed.).* Los Angeles, CA., Western Psychological Services.

Fletcher, A. C., Nickerson, P., & Wright, K. L. (2003). Structured leisure activities in middle childhood: Links to well-being. *Journal of Community Psychology,* 31, 6, 641-659.

Fox, K., & Corbin, C. (1989). The physical perception profile: development and preliminary validation. *Journal of Sport and Exercise Psychology,* 11, 4, 408-430.

Fox, K. R. (2000). Self-esteem, self-perceptions and exercise. *International Journal of Sport Psychology,* 31, 2, 228-240.

Gabbard, C., & Barton, J. (1979). Effects of physical activity on mathematical computation among young children. *Journal of Psychology,* 103, 2, 287-288.

Gendron, M., Royer, E., Bertrand, R., & Potvin, P. (2004). Behaviour disorders, social competence and the practice of physical activities among adolescents. *Emotional and Behavioural Difficulties,* 9, 4, 249-259.

Gittelsohn, J., Steckler, A., Johnson, C. C., Pratt, C., Grieser, M., Piclcrel, J., Stone, E. J., Conway, T., Coombs, D., & Staten, L. K. (2006). Formative research in school and community-based health programs and studies: "State of the art" and the TAAG approach. *Health Education & Behavior,* 33, 1, 25-39.

Gresham, F., Elliott, S., & Evans-Fernandez, S. E. (1993). *Student Self-Concept Scale Manual.* Circle Pines, MN., American Guidance Service.

Gresham, F. M., & Elliott, S. N. (1990). *Social Skills Rating System Manual.* Circle Pines, MN., American Guidance Service.

Guest, A., & Schneider, B. (2003). Adolescents' extracurricular participation in context: The mediating effects of schools, communities, and identity. *Sociology of Education,* 76, 2, 89-109.

Harter, S. (1985). *Manual for the Self-Perception Profile for Children.* Denver, CO., The University of Denver.

--- (1982). The perceived competence scale for children. *Child Development,* 53, 1, 87-97.

Hervet, R. (1952). Vanves, son experience, ses perspectives. *Revue de l'Institut National des Sports,* 24, 4-6.

Hunt, H. D. (2005). The effect of extracurricular activities in the educational process: Influence on academic outcomes? *Sociological Spectrum,* 25, 4, 417-445.

Ignico, A. A., Richhart, C., & Wayda, V. K. (1999). The effects of a physical activity program on children's activity level, health-related fitness, and self-esteem. *Early Child Development and Care,* 154, 1, 31-39.

Jago, R., & Baranowski, T. (2004). Non-curricular approaches for increasing physical activity in youth: a review. *Preventive Medicine,* 39, 1, 157-163.

Jordan, W. J. (1999). Black high school students' participation in school-sponsored sports activities: Effects on school engagement and achievement. *Journal of Negro Education,* 68, 1, 54-71.

Keays, J. J., & Allison, K. R. (1995). The effects of regular moderate to vigorous physical-activity on student outcomes - a review. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique,* 86, 1, 62-65.

Kendzierski, D., & Decarlo, K. J. (1991). Physical-activity enjoyment scale - 2 validation studies. *Journal of Sport & Exercise Psychology,* 13, 1, 50-64.

Kimm, S. Y. S., Glynn, N. W., Kriska, A. M., Barton, B. A., Kronsberg, S. S., Daniels, S. R., Crawford, P. B., Sabry, Z. I., & Liu, K. (2002). Decline in physical activity in black girls and white girls during adolescence. *New England Journal of Medicine,* 347, 10, 709-715.

King, G., McDougall, J., DeWit, D., Hong, S., Miller, L., Offord, D., Meyer, K., & LaPorta, J. (2005). Pathways to children's academic performance and prosocial behaviour: roles of physical health status, environmental, family, and child factors. *International Journal of Disability, Development and Education,* 52, 4, 313–344.

Kirkcaldy, B. D., Shephard, R. J., & Siefen, R. G. (2002). The relationship between physical activity and self-image and problem behaviour among adolescents. *Social Psychiatry and Psychiatric Epidemiology,* 37, 11, 544-550.

Lakes, K. D., & Hoyt, W. I. (2004). Promoting self-regulation through school-based martial arts training. *Journal of Applied Developmental Psychology,* 25, 3, 283-302.

Lindner, K. J. (2002). The physical activity participation-academic performance relationship revisited: Perceived and actual performance and the effect of banding (academic tracking). *Pediatric Exercise Science,* 14, 2, 155-169.

--- (1999). Sport participation and perceived academic performance of school children and youth. *Pediatric Exercise Science,* 11, 2, 129-143.

Maibach, E. W. (2003). Recreating communities to support active living: A new role for social marketing. *American Journal of Health Promotion,* 18, 1, 114-119.

Maibach, E. W., Rothschild, M. L., & Novelli, W. D. (2002). Social Marketing. In K. Glanz, Rimer, B. K., & Marcus-Lewis, F. (Eds). *Health Behavior and Health Education: Theory, Research, and Practice*, (p. 437-461), San Francisco, CA., Jossey-Bass.

Marsh, H. W. (1990). *Self Description Questionnaire--II Manual.* Sydney, University of Western Sydney.

--- (1988). *Self Description Questionnaire--I Manual* Sydney, University of Western Sydney.

Marsh, H. W., & O'Neill, R. (1984). Self Description Questionnaire III (SDQ III): The construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement,* 21, 2, 153-174.

Marsh, H. W., Richards, G. E., Johnson, S., Roche, L., & Tremayne, P. (1994). Physical Description Questionnaire: properties and a multitrait-multidimensional analysis of relations to existing instruments. *Journal of Sports and Exercise Psychology,* 16, 3, 270-305.

McHale, J. P., Vinden, P. G., Bush, L., Richer, D., Shaw, D., & Smith, B. (2005). Patterns of personal and social adjustment among sport-involved and noninvolved urban middle-school children. *Sociology of Sport Journal,* 22, 2, 119-136.

McKenzie, T. L., Marshall, S. J., Sallis, J. F., & Conway, T. L. (2000). Leisure time physical activity in school environments:an observational study using SOPLAY. *Preventive Medicine,* 30, 1, 70-77.

McKenzie, T. L., Sallis, J. F., Prochaska, J. J., Conway, T. L., Marshall, S. J., & Rosengard, P. (2004). Evaluation of a two-year middle-school physical education intervention: M-SPAN. *Medicine and Science in Sports and Exercise,* 36, 8, 1382-1388.

McNaughten, D., & Gabbard, C. (1993). Physical exertion and the immediate mental performance of sixth-grade children. *Perceptual and Motor Skills,* 77, 3, 1155-1159.

Milio, N. (1981). *Promoting Health Through Public Policy.* Philadelphia, F. A. Davis.

Miller, K. E., Melnick, M. J., Barnes, G. M., Farrell, M. P., & Sabo, D. (2005). Untangling the links among athletic involvement, gender, race, and adolescent academic outcomes. *Sociology of Sport Journal,* 22, 2, 178-193.

Moe, S. G., Pickrel, J., McKenzie, T. L., Strikmiller, P. K., Coombs, D., & Murrie, D. (2006). Using school-level interviews to develop a multisite PE intervention program. *Health Education & Behavior,* 33, 1, 52-65.

Parcel, G. S., Kelder, S., & Basen-Engquist, K. (2000). The school as a setting for health promotion. In B. D. Poland, Green, L. W., & Rootman, I. (Eds). *Settings for Health Promotion*, (p. 86-137), Thousand Oaks, California, Sage Publications.

Parfitt, G., & Eston, R. G. (2005). The relationship between children's habitual activity level and psychological well-being. *Acta Paediatrica,* 94, 12, 1791-1797.

Pereira, M. A., Fitzgerald, S. J., Gregg, E. W., Joswiak, M. L., Ryan, W. J., Suminski, R. R., Utter, A. C., & Zmuda, J. M. (1997). A collection of physical activity questionnaires for health-related research: The Modifiable Activity Questionnaire for Adolescents. *Medicine and Science in Sports and Exercise,* 29, S79-S82.

Petitpas, A. J., & Champagne, D. E. (2000). Sports and social competence. In S. J. Danish, & Gulotta, T. P. (Eds). *Developing Competent Youth and Strong Communities Through After-School Programming*, (p. 115-137), Washington, DC, Child Welfare League of America.

Petosa, R. L., Hortz, B. V., Cardina, C. E., & Suminski, R. R. (2005). Social Cognitive Theory variables associated with physical activity among high school students. *International Journal of Sports Medicine,* 26, 2, 158-163.

Raviv, S., & Low, M. (1990). Influence of physical activity on concentration among junior high-school students. *Perceptual and Motor Skills,* 70, 1, 67-74.

Richman, E. L., & Shaffer, D. R. (2000). "If you let me play sports" - How might sport participation influence the self-esteem of adolescent females? *Psychology of Women Quarterly,* 24, 2, 189-199.

Rosenberg, M. (1965). *Society and the Adolescent Self-Image.* Princeton, NJ, Princeton University Press.

Rouse, K. A. G., Barnaca-Gomez, M. Y., Newman, P., & Newman, B. (2001). Educationally resilient adolescents' implicit knowledge of the resilience phenomenon. 109th conference of the American Psychological Association, SanFrancisco, CA, August 24-28. Retrieved December 6, 2006, from http://eric.ed.gov/ERICDocs/data/ericdocs2/content_storage_01/0000000b/80/0d/9c/6e.pdf.

Sallis, J. F., McKenzie, T. L., Conway, T. L., Elder, J. P., Prochaska, J. J., Brown, M., Zive, M. M., Marshall, S. J., & Alcaraz, J. E. (2003). Environmental interventions for eating and physical activity - a randomized controlled trial in middle schools. *American Journal of Preventive Medicine,* 24, 3, 209-217.

Sallis, J. F., McKenzie, T. L., Kolody, B., Lewis, M., Marshall, S., & Rosengard, P. (1999). Effects of health-related physical education on academic achievement: Project SPARK. *Research Quarterly for Exercise and Sport,* 70, 2, 127-134.

Sévigny, M. D. (2003). "Impact de la défavorisation socio-économique sur la diplomation des élèves inscrits dans les écoles secondaires publiques de l'île de Montréal." Montreal, Comité de gestion de la taxe scolaire de l'île de Montréal. Retrieved December 6, 2006, from http://www.cgtsim.qc.ca/pls/htmldb/f?p=105:3:10215251214464014947:OK:NO:::.

Shephard, R. J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science,* 9, 2, 113-126.

Shephard, R. J., Volle, M., Lavalée, H., LaBarre, R., Jéquier, J. C., & Rajic, M. (1984). Required physical activity and academic grades: A controlled longitudinal study. In J. Ilmarinen, & Välimäki, I. (Eds). *Children and Sport*, (p. 53-57), Berlin, Springer Verlag.

Simon, C., Wagner, A., DiVita, C., Rauscher, E., Klein-Platat, C., Arveiler, D., Schweitzer, B., & Triby, E. (2004). Intervention centred on adolescents' physical activity and sedentary behaviour (ICAPS): Concept and 6-month results. *International Journal of Obesity,* 28, S96-S103.

Simon, C., Wagner, A., Platat, C., Arveiler, D., Schweitzer, B., Schlienger, J. L., & Triby, E. (2006). ICAPS: A multilevel program to improve physical activity in adolescents. *Diabetes and Metabolism,* 32, 1, 41-49.

Smith, W. A. (1999). Marketing with no budget. *Social Marketing Quarterly,* 5, 2, 6-11.

Staten, L. K., Birnbaum, A. S., Jobe, J. B., & Elder, J. P. (2006). A typology of middle school girls: Audience segmentation related to physical activity. *Health Education & Behavior,* 33, 1, 66-80.

Stevens, J., Murray, D. M., Catellier, D. J., Hannan, P. J., Lytle, L. A., Elder, J. P., Young, D. R., Simons-Morton, D. G., & Webber, L. S. (2005). Design of the trial of activity in adolescent girls (TAAG). *Contemporary Clinical Trials,* 26, 2, 223-233.

Stone, E. J., McKenzie, T. L., Welk, G. J., & Booth, M. L. (1998). Effects of physical activity interventions in youth: Review and synthesis. *American Journal of Preventive Medicine,* 15, 4, 298-315.

Sutton, A., & Soderstrom, I. (1999). Predicting elementary and secondary school achievement with school-related and demographic factors. *The Journal of Educational Research,* 92, 6, 330-338.

Taras, H. (2005). Physical activity and student performance at school. *Journal of School Health,* 75, 6, 214-218.

Tomporowski, P. D. (2003). Cognitive and behavioral responses to acute exercise in youths: A review. *Pediatric Exercise Science,* 15, 4, 348-359.

Tracy, A. J., & Erkut, S. (2002). Gender and race patterns in the pathways from sports participation to self-esteem. *Sociological Perspectives,* 45, 4, 445-466.

Tremblay, M. S., Inman, J. W., & Willms, J. D. (2000). The relationship between physical activity, self-esteem, and academic achievement in 12-year-old children. *Pediatric Exercise Science,* 12, 3, 312-323.

Trost, S. G., Pate, R. R., Sallis, J. F., Freedson, P. S., Taylor, W. C., Dowda, M., & Sirard, J. (2002). Age and gender differences in objectively measured physical activity in youth. *Medicine and Science in Sports and Exercise,* 34, 2, 350-355.

Videon, T. M. (2002). Who plays and who benefits: gender, interscholastic athletics, and academic outcomes. *Sociological Perspectives,* 45, 4, 415-444.

Wilson, D. K., Evans, A. E., Williams, J., Mixon, G., Sirard, J. R., & Pate, R. (2005). A preliminary test of a student-centered intervention on increasing physical activity in underserved adolescents. *Annals of Behavioral Medicine,* 30, 2, 119-124.

World Health Organisation (1986). *Ottawa Charter for Health Promotion: First International Conference on Health Promotion.* Ottawa, WHO.

Yin, Z. N., & Moore, J. B. (2004). Re-examining the role of interscholastic sport participation in education. *Psychological Reports,* 94, 3, 1447-1454.

Chapter 3

Research Article

This article is formatted according to the specific manuscript guidelines outlined by *Health Education and Behavior*, the journal to which the article will be submitted.

Physical Activity Promotion among Underserved Adolescents: "Make it Fun, Easy, and Popular"[12]

Paula L. Bush[13], Suzanne Laberge[13], Sophie Laforest[13]

Abstract

There is a paucity of studies regarding non-curricular physical activity promotion interventions among adolescents, and even less such research pertaining to underserved youth. This article discusses the development and implementation of a non-curricular, school based physical activity promotion program designed for a multiethnic, underserved population of adolescents. The impact of the program on leisure time physical activity (LTPA) and on physical activity enjoyment (PAE) is also presented. The 16 week program, named FunAction, utilized social marketing principles. Control ($n = 90$) and intervention ($n = 131$) students were assessed pre and post intervention for levels of LTPA and PAE. Results indicate that although the program did not contribute to an increase in LTPA, nor in PAE among intervention group students, participation in the program was elevated. This study offers preliminary evidence that non-curricular physical activity promotion programs, which apply social marketing principles, can be effective in engaging multiethnic, underserved adolescents in physical activity.

Keywords: low socioeconomic status, social marketing, school, multiethnic

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Introduction and Background

It is a truism of health promotion that we must "make the healthy choice the easy choice" (Milio, 1981). To do so, it is necessary to provide readily available, appealing programs which focus on various determinants of health. Physical activity is an important health determinant, yet when it comes to physical activity promotion among adolescents, and specifically those from low income backgrounds, statistics indicate that physical activity promoters are not reaching this demographic. In fact, a mere 27% of Canadian boys and 14% of Canadian girls between the ages of 12 and 19 are accruing sufficient daily physical activity to meet the international guidelines for optimal growth and development (Cameron, Craig, & Paolin, 2005). Moreover, teenagers in Quebec are the least likely to meet these guidelines when compared to other Canadian adolescents. What is more, individuals of low socioeconomic status are less active than their more advantaged counterparts (Cameron et al., 2005).

Promoting physical activity among youth populations is important because physical activity participation declines during adolescence (Cameron et al., 2005; Trost et al., 2002). Furthermore, exposing young people to recreational physical activity through the school has been shown to influence physical activity patterns later in life, across socioeconomic groups (Burton, Turrell, & Oldenburg, 2003). In fact, the school is a promising setting for physical activity promotion among adolescents (Parcel, Kelder, & Basen-Engquist, 2000; Pate et al., 2006), and school based physical activity promotion interventions have, indeed, become increasingly popular in recent years (Baranowski, Anderson, & Carmack, 1998;

Stone, McKenzie, Welk, & Booth, 1998). However, only a minority of these studies have examined the effects of non-curricular programs (Jago & Baranowski, 2004), and according to Cale and Harris (2006) there is a need to move beyond the curriculum when developing physical activity promotion programs designed for youth populations.

To our knowledge, there are no more than five studies (Engels, Gretebeck, Gretebeck, & Jimenez, 2005; Sallis et al., 2003, Simon et al., 2004; Stevens et al., 2005; Wilson et al., 2005), evaluating the effectiveness of school based non-curricular physical activity promotion programs designed for adolescents. Among them is the Trial of Activity for Adolescent Girls (TAAG) study (Stevens et al., 2005; Staten, Birnbaum, Jobe, & Elder, 2006), which was designed specifically for girls and applied social marketing strategies, but for which results are, as yet, unavailable. Another is the Students and Parents Actively Involved in Being Fit study (Engels et al., 2005), in which the authors measured indicators of physical fitness but not the amount of physical activity practiced. Authors of the Intervention Centred on Adolescents' Physical Activity and Sedentary Behaviour (ICAPS) (Simon et al., 2004, 2006), and Middle-School Physical Activity and Nutrition (M-SPAN) (McKenzie et al., 2004; Sallis et al., 2003) studies, on the other hand, measured physical activity levels. However, in these studies, participation in program activities was included in the measure of physical activity. The authors did not measure the impact of the programs on the amount of physical activity practiced outside of the interventions. Nonetheless, preliminary ICAPS results indicate a significant increase in overall voluntary physical activity for all participants, whereas M-SPAN results indicate an increase in voluntary

physical activity for boys only. Finally, among these five studies, Wilson et al. (2005) were the only authors to specifically study an underserved population. Their quasi-experimental study consisted of a four week student-centered physical activity promotion program based on the social cognitive and self-determination theories. The program involved one hour of moderate to vigorous physical activity after school, three days per week. Physical activity was measured with accelerometers on both program and non-program days. At the end of the intervention, results for both program and non-program days revealed that students in the intervention group demonstrated a greater increase in time spent in moderate and moderate to vigorous physical activity as compared to the control group students.

The dearth of information pertaining to adolescent non-curricular physical activity programs is evident, especially for the economically disadvantaged. Therefore, for the present study, we developed and implemented a school based, non-curricular, physical activity promotion program, named FunAction. The program was designed for a population of eighth grade students in an underserved, multiethnic middle-school Moreover, FunAction was based on principles of social marketing (Maibach, Rothschild, & Novelli, 2002; Maibach, 2003); participation in program activities was entirely voluntary. Two research hypotheses were explored. First, we hypothesized that the supply of a non-curricular physical activity promotion program based on principles of social marketing would entice adolescent boys and girls to participate. Second, we hypothesized that the supply of such a program would have a positive impact on students' LTPA and PAE. It is

important to note that in this study, LTPA is defined as physical activity practiced outside of both the FunAction program and physical education classes.

The Social Marketing Approach

Given that participation in FunAction was voluntary, it was necessary to offer a plethora of physical activity opportunities which participants would find appealing. Thus, principles of social marketing were utilized. Social marketing is "a process that attempts to create voluntary exchange between a marketing organization and members of a target market based on mutual fulfillment of self-interest" (Maibach et al., 2002). Therefore, in order to develop and implement physical activity promotion programs in which participants want to participate, it is necessary to understand their interests. According to Maibach (2003), a crucial step is to profile the priority population. In the case of the FunAction intervention, this involved developing an understanding of the benefits the students perceived to be associated with participating in school based non-curricular physical activity. Moreover, identifying the barriers to participation was essential in order to take steps to reduce them, thus, making it easier for participants to get involved. Population segmentation is an additional principle of social marketing. Therefore, identifying subgroups within the priority population was necessary in order to offer these groups specific physical activities, thus attracting a wider audience and increasing the popularity of the program.

Methodology

Profile of the Priority Population

To help ensure that the FunAction program would be appealing to participants, the program was developed based on their needs, interests, and aspirations. To achieve this, during the program development and implementation phases, regular meetings were held with the physical education teachers to help us understand the priority population. Two main barriers to being active were identified. First, most students were either unavailable or not interested in after school activities. Therefore, all FunAction activities were scheduled during the lunch hour, despite this being a period during which many students were often occupied with other types of activities. Second, the school was not equipped with shower facilities. This discouraged some students, so lower intensity activities were included in the program. Moreover, the physical education teachers identified various ethnic and social subgroups within the diverse student body and suggested appropriate activities. This helped us to develop a program which would account for the cultural diversity of participants. Also, during the implementation phase, participants themselves were surveyed twice regarding their physical activity preferences. Participants also made informal suggestions and requests throughout the intervention. This further helped us to adapt the activities and incentives offered, as well as the promotional means used, to the participants' needs and interests.

FunAction Program Description

The focus of all program activities was on fun. An attempt was made to offer activities to please various subgroups of the population as well as to offer activities which would be perceived as *in*, or new and exciting.

During the first wave of the sixteen week intervention, activities included African dance, Cardio-Surprise (a mix of aerobics and various dance styles), 'Abdominator', (an exercise ball activity), Kung Fu, Hip-hop, "World Cup" (a team sport tournament of soccer and basketball), *Dance Dance Revolution* (an active music video game also known as *Dancing Stage*), and Capoeira (a Brazilian martial art). Half way through the implementation phase, program modifications were made in accordance with participation levels, leader availability, participants' informal requests, participants' survey responses, and the advent of warmer weather. As a result, Capoeira, Kung Fu, 'Abdominator', and Hip-Hop were all cancelled, whereas an outdoor walking/running group, weight training, and outdoor soccer for girls were added. Overall, the FunAction program offered an average of 9 ± 2 activities each week for a total of 152 physical activity opportunities. Table 1 outlines the number of times each activity was offered.

Table 1. Total number of sessions offered for each activity

Physical Activity	Number of sessions offered
World cup	26
Hip hop	13
Kung fu	16
Cardio-surprise	11
African dance	15
Capoeira	8
Dance Dance Revolution	40
Soccer	4
Walking/running	3
"Abdominator"	11
Weight training	1
Total	**152**

Promotional Means

The FunAction program's promotion entailed a kick off event, regular ongoing promotional means, special activities, leaflets, and incentives.

The kick off event consisted of a day of organized, physical activities at the university sports complex, and served to introduce participants to FunAction and its team and also to expose the students to a variety of less traditional physical activities.

With regards to the *regular ongoing promotional means*, twice each day, students announced the day's activity schedule over the public address system. Also, three banners displaying the FunAction logo were posted in high traffic areas in the school. All information relevant to new program activities, coming events, and prizes was posted under

these banners. Photographs of students partaking in the various activities were displayed at these locations. Schedules of program activities were posted under the banners, and also in each classroom.

Several *special activities* were organized. First, three lunch time variety shows were produced in collaboration with school personnel and the local YMCA. They served to promote the program, increase participation levels, and to give participants occasions to showcase what they were doing with FunAction. Second, an outdoor field day was held in the 13th week. A riddle was used to promote the event. To entice participation, it was announced that participants would receive clues to the enigma, and prizes would be awarded to the winners. Finally, participants were offered the opportunity to take part in the annual City of Montreal day long cycling event. Given the economically disadvantaged characteristic of the FunAction priority population, it was deemed necessary to eliminate the cost barrier in order to make it easier for the students to take part. Hence, through an agreement with the event organizers, participants had the opportunity to participate at no cost.

Five promotional *leaflets* were produced and distributed during the program implementation phase. The content and visual aspects of the leaflets were adapted to the priority population in order to capture their interest. These leaflets served to educate participants about various health related themes and also to promote FunAction. Photographs of participants, 'World Cup' results, and information pertaining to coming events were all regular features.

Finally, *incentives* included T-shirts with the FunAction logo, and participation prizes. Moreover, some activities included contests but, given the population, participation and positive attitude, rather than skill and competition, were rewarded

Program Delivery

All activities were led by Kinesiology and other university students and were offered free of charge. With regards to the schedule, up to three different activities per day were offered three to five days per week. Each activity was scheduled one to three times per week depending on its popularity and the availability of the leader. The activities were offered during the first 45 minutes of the 75 minute lunch period. Since the gymnasium was only available for FunAction activities two to three days per week and since it could accommodate no more than one activity at a time, the World Cup was the only activity held in this location. Moreover, the school's playground was a paved area limiting the possibilities for outdoor activities. Therefore, with the exception of the World Cup, all activities took place in classrooms. These rooms were not conducive to intense physical activity, nor could they accommodate large groups of students in motion. As such, activities were of low intensity and were offered to a maximum of 12 students at a time.

Research Design

The FunAction intervention took place in an underserved, multiethnic middle-school (grades 7 and 8) in Montreal, Quebec, Canada. School enrollment consisted of just over 300 students of 94 different national origins. This school was the 13th most impoverished of the 93 middle and secondary schools in Montreal. To evaluate the impact

of the supply of the program on leisure time physical activity (LTPA) and physical activity enjoyment (PAE), a quasi-experimental design was used. The intervention group consisted of the students in six grade eight classes (n = 165). In view of the distinct sociocultural makeup of the student body, it was not deemed possible to compare the study's participants to students from another school. Therefore, the control group consisted of the students from five grade seven classes in the same school (n = 137). Baseline and post intervention data were collected via self report questionnaires in December 2004 and June 2005 respectively.

Ninety-five percent (n = 157) of the intervention group students and eighty-seven percent (n = 144) of control group students had parental consent to participate in the study. Due to student absences during the pre and posttest days, complete data sets were available for 90 control group students and 131 experimental group students. Table 2 presents some sociodemographic characteristics of the study groups. Note that the ratio of boys to girls in the control group was equally disproportional in the initial sample of 137 students.

Table 2. FunAction Sample Description

	Control Group		Intervention Group	
	Boys	Girls	Boys	Girls
n	28	62	62	69
Age (yrs)				
Range	11 to 14	11 to 14	13 to 15	13 to 16
Mean *	12.5 (0.6)	12.5 (0.6)	13.9 (0.7)	13.8 (0.9)
Born outside of Quebec (%)	50.0	45.9	56.5	58.0
Mean * number of years in Quebec (if born outside of Quebec)	5.0 (3.0)	4.6 (3.2)	7.5 (4.2)	6.0 (3.8)

*Standard deviations are shown in parentheses

Measures

Leisure Time Physical Activity (LTPA) was assessed with an adapted version of a translation of the 7 Day Physical Activity Recall (7DPAR) (Santé Québec, 1999). Students were asked "During the last week, did you participate in sports or physical activities which made you sweat or breathe rapidly?" They indicated the amount of time spent engaged in such LTPA, in increments of fifteen minutes (0-14 minutes to 60 minutes or more), for each of the seven days of the preceding week. A score for the week, between 7 (0 to 98 minutes) and 35 (420 minutes or more), was calculated for each adolescent.

Physical Activity Enjoyment (PAE) was assessed with a French translation of an adapted version (Motl et al., 2001) of the 14 item self-report PACES questionnaire (Kendzierski & DeCarlo, 1991). Note that in this study a four point scale (agree a lot, agree a little, disagree a little, disagree a lot) was used. A score between 14 (low level of PAE)

and 56 (high level of PAE) was calculated for each student. Given that we translated the instrument, we pretested it to establish content validity. Chronbach's alpha for baseline data was .89.

Frequency of Participation in FunAction activities was assessed by the number of FunAction activities attended by each student.

FunAction *Program Appreciation* was assessed, post intervention, by the extent (yes, no, maybe) to which intervention group students reported wanting FunAction to continue the following school year.

Data Analysis

Our first hypothesis was that the supply of a non-curricular physical activity promotion program based on principles of social marketing would entice adolescent boys and girls to participate. Number of participants, frequency of participation, and program appreciation were analyzed to test this hypothesis. First, results pertaining to the number of participants and their participation frequency were calculated. Five categories of participation frequency ranging from no participation, to an average participation frequency of once per week were used. Second, we assessed whether students with higher LTPA and/or PAE self selected into the program. To do so, participants were placed into three groups of equivalent size, based on their frequency of participation. Students who participated 0 or 1 time (n = 46) were classified as *low* level of participation, those who participated between 2 and 8 times (n = 45) were classified in the *average* participation group, and those who participated 9 times or more (n = 48) were put in the *high*

participation group. One way ANOVA were used to compare these groups with respect to their pre-intervention LTPA and PAE levels and contrasts were constructed to assess which groups were different. Note that for these analyses three groups, rather that five, were used to ensure adequate group size for the analyses. Third, intervention group students' appreciation of FunAction was analyzed in relation to their frequency of participation.

Our second hypothesis was that the FunAction program would have a positive impact on students' LTPA and PAE. To explore this, we first analyzed the impact of the supply of the program on the continuous outcome variables LTPA and PAE. Repeated measures analyses of variance (ANOVA) were used to examine the interactions between Group (control and intervention), Time (baseline and 16 weeks), and sex. Second, we analyzed the impact of participation in FunAction on LTPA and PAE. The difference between intervention group students' pre and posttest LTPA and PAE scores was calculated and then correlated with frequency of participation. All analyses were conducted with SPSS (version 14) (Pavkov & Pierce, 2006).

Results

Program Participation Frequency and Program Appreciation

Participation in FunAction was voluntary. As such, among intervention students, participation frequency varied from 0 to 34 times. Figure 1 shows the extent to which boys and girls participated in program activities according to five categories of participation frequency.

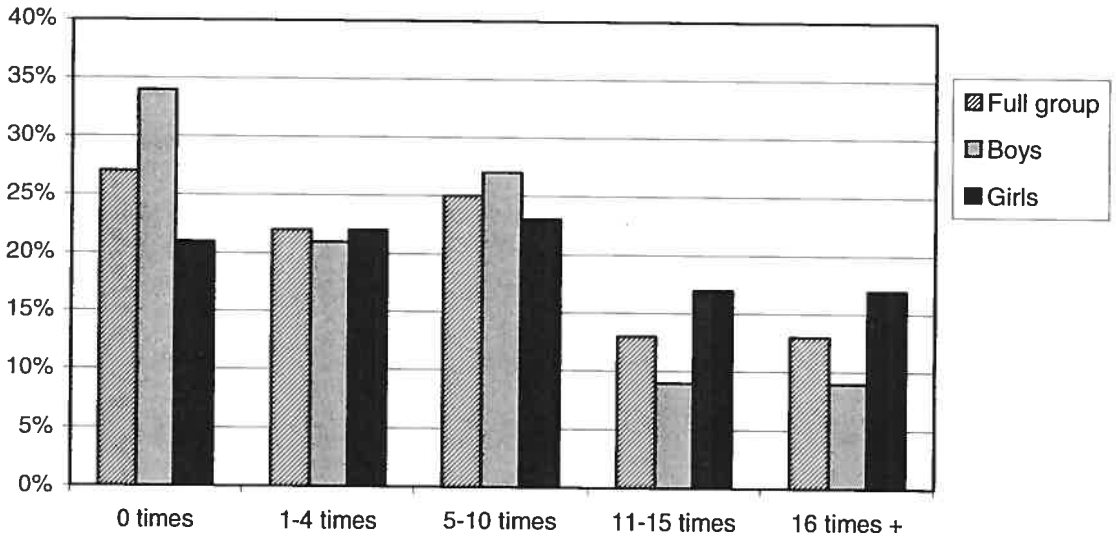

Figure 1. Frequency of Participation in FunAction Activities for Boys and Girls

Over the course of the 16 week intervention, 93 out of the 131 (71%) students in the intervention group participated in at least one activity offered by FunAction. Additionally, 50.0% percent of the intervention group students participated in 5 activities or more. When analyzed by sex, we observe that 50.0% of the girls participated in more than five activities, as compared to 38.8% of the boys. This difference, however, was not significant. Moreover, among those who participated in more than 5 activities, girls had an average overall participation rate of 14 ± 6 times, whereas boys participated an average of 13 ± 7 times overall. Again, this difference was not significant. Finally, one third of the intervention group students were present in one activity each week (mean $n = 45 \pm 12$). Many students participated in more than one activity per week; as such the total average weekly participation was 61 ± 20 students.

With regards to self selection, Table 3 displays the mean pretest LTPA and PAE scores of low, average, and high participation boys and girls.

Table 3. Mean* Pretest (LTPA) and Physical Activity Enjoyment (PAE) Scores of Intervention Group Boys and Girls according to Three Categories of Participation

	Low participation		Average participation		High participation	
	Boys	Girls	Boys	Girls	Boys	Girls
LTPA						
n	26	20	21	24	15	24
score	13.0 (5.1)	12.9 (4.9)	19.6 (6.7)	14.7 (6.0)	18.6 (5.7)	14.6 (6.0)
PAE						
n	25	20	21	24	15	23
score	45.0 (8.1)	42.9 (9.3)	50.0 (5.4)	45.5 (8.2)	50.2 (2.9)	48.6 (5.4)

*Standard deviations are shown in parentheses

Among the boys, one way ANOVA results indicate a significant difference between groups for LTPA (F [2, 59] = 8.46, p = .00). Contrast tests reveal that low participation boys had significantly lower pretest LTPA than both medium and high participation boys (t [59] = -2.92, p = .01 and t [59] = -3.19, p = .00 respectively). Among the girls, no significant difference between groups for pretest LTPA (F [2, 65] = .72, p = .49) was observed. Contrast tests reveal no significant difference between the groups of girls for pretest LTPA either. These results indicate that while FunAction attracted boys who had higher LTPA at the outset, girls were attracted to program activities regardless of their pretest LTPA levels.

Regarding pretest PAE scores, a significant difference between groups was observed for boys' (F [2, 58] = 4.86, p = .01). In fact, contrast test results indicate that low participation boys had significantly lower pretest PAE scores than both their medium and high participation counterparts (t [33] = -2.93, p = .01 and t [42] = -2.49, p = .02 respectively). However, as pertains to girls, while no significant difference between groups (F [2, 64] = 2.94, p = .06) was observed, contrast test results indicate that high participation girls reported significantly higher scores than low high participation counterparts (t [64] = -2.42, p = .02). Average participation girls, however, did not have significantly different pretest PAE than low participation girls (t [64] = -1.12, p = .27). Therefore, FunAction attracted boys with higher pretest PAE. However, among girls, the fact low participation girls had significantly different pretest PAE than high, but not average, participation girls, indicates that FunAction was somewhat successful in engaging girls regardless of their pretest PAE.

Finally, with respect to intervention group students' appreciation of FunAction, 78% of the boys and 81% of the girls expressed an interest (maybe/yes) in having FunAction continue the following year. Moreover, 55.8% of those who did not participate in any FunAction activities expressed the same interest (Figure 2). No significant difference was observed between the boys and the girls.

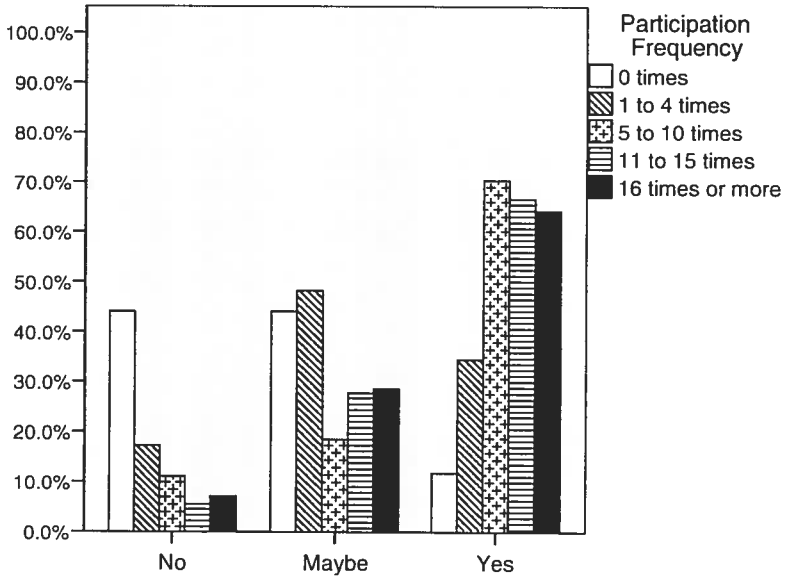

Figure 2. Level of Interest for the Continuation of FunAction according to Frequency of Participation in the Program

Impact of Program Supply

Table 4 shows the pre and posttest LTPA and PAE scores for both study groups. With respect to LTPA, univariate ANOVA results indicate that control and intervention group students were not significantly different at the outset (F [1, 215] = 2.88; p = .09). No interaction between group and sex was observed prior to the intervention either (F [1, 215] = .10; p = .76). As pertains to pretest PAE, no significant difference was observed between control and intervention groups (F [1, 214] = 2.10; p = .15). No Group X Sex interaction was observed either (F [1, 214] = 2.68 p = .10).

Impact of program supply on LTPA: To assess the effect of the supply of the FunAction program on LTPA, control and intervention group students were compared.

Repeated measures of analysis of variance (ANOVA) from pretest to posttest showed that while all students increased their LTPA level over time (F [1, 215] = 34.99; p = .00), no significant Time X Group interaction (F [1, 215] = 1.19; p = .28) was observed. No significant Time X Group X Sex (F [1, 215] = .24; p = .62), nor Time X Sex (F [1, 215] = .11; p = .75) interactions were observed either. These results indicate that although participants exhibited a significant increase in LTPA between the beginning and end of the intervention, this increase was not due to the supply of the FunAction program.

Impact of program supply on PAE: Results indicate no significant variation in PAE scores over time for any of the students (F [1, 215] = 2.00; p = .15). More importantly, no significant Time X Group interaction (F [1, 208] = .31; p = .58) was observed. Moreover, results indicate no significant Time X Group X Sex (F [1, 208] = .08; p = .78), nor Time X Sex (F [1, 208] = 1.53; p = .22) interactions either. These results indicate that the supply of the FunAction physical activity promotion program had no impact on participants' levels of PAE. It is noteworthy that all students reported relatively high levels of PAE prior to the intervention (Table 4). A lack of variation can, therefore, be expected.

Table 4. Pre-/Post-Intervention Scores[a] of Leisure Time Physical Activity (LTPA) and Physical Activity Enjoyment (PAE) for Control and Intervention Group Students

	Full sample		Boys		Girls	
	Control	Inter-vention	Control	Inter-vention	Control	Inter-vention
LTPA						
n	90	130	27	62	62	68
Pre[b]	16.3 (6.1)	15.3 (6.2)	18.4 (6.6)	16.6 (6.5)	15.4 (6.5)	14.1 (5.7)
Post[b]	18.7 (8.2)	18.8 (8.2)	20.8 (9.1)	20.5 (8.7)	17.9 (7.7)	17.2 (7.2)
PAE						
n	90	123	27	59	62	64
Pre[c]	48.5 (6.0)	46.8 (7.5)	47.7 (6.0)	47.9 (6.7)	48.8 (6.1)	45.7 (8.0)
Post[c]	48.1 (6.2)	45.9 (8.3)	46.8 (5.9)	46.2 (9.2)	48.9 (6.2)	45.5 (7.5)

[a] Mean scores. Standard deviations are shown in parentheses
[b] LTPA score range: 7 to 35
[c] PAE score range: 14 to 56

Impact of Participation in the Program

Impact of participation in program on LTPA: To assess the impact of participation in FunAction activities on students' levels of LTPA, the amount of increase in LTPA between pretest and posttest was calculated and correlated with participation frequency. The range of increase and mean increase in LTPA of intervention group students are shown in Table 5. No significant correlation between the increase in LTPA level and frequency of participation was observed in the full intervention group ($r = .03$; $p = .70$), the boys ($r = .08$; $p = .56$), or the girls ($r = .02$; $p = .90$). Students' increase in LTPA levels is attributable to other factors unexplained by the present study.

Impact of participation in program on PAE: Similar analyses were conducted to assess the impact of participation in FunAction activities on participants' PAE levels. Table 5 shows the range of variation and mean variation in PAE of intervention group students. No significant correlation between frequency of participation and change in PAE in the full intervention group ($r = 0.00$; $p = .99$), the boys ($r = .01$; $p = .94$), or the girls ($r = -0.05$, $p = 0.73$) was observed.

Table 5. Mean* Difference between Pre and Posttest for Leisure Time Physical Activity (LTPA) and Physical Activity Enjoyment (PAE) Scores of Intervention Group Students

	Full group	Boys	Girls
LTPA			
n	130	62	68
Range	-12 to 21	-6 to 21	-12 to 20
Mean	3.5 (6.3)	3.9 (5.8)	3.1 (6.7)
PAE			
n	123	22	64
Range	-36 to 22	-36 to 22	-19 to 20
Mean	-0.9 (7.1)	-1.6 (8.6)	-0.2 (5.2)

*Standard deviations are shown in parentheses

Discussion

The purpose of the FunAction project was to develop, implement, and assess the impact of a non-curricular school based physical activity promotion program designed for a multiethnic population of low income adolescents. To assess the impact of the FunAction intervention, two hypotheses were explored. First, that that the supply of a non-curricular

physical activity promotion program based on principles of social marketing would entice adolescent boys and girls to participate. Results concerning adolescents' participation are favorable. During the 16 week program, 71% of the intervention group students participated in at least one activity, half participated in five or more activities, and one third participated in one or more activities each week. Moreover, though not a statistically significant difference, a higher percentage of girls than boys took part in FunAction activities. This is similar to the results observed in the ICAPS program which also accounted for barriers to being active (Simon et al., 2004, 2006). As the physical activity promoters, we feel that this rate of participation is quite good considering the numerous implementation barriers we encountered, and also considering the barriers to being active faced by the students.

Regarding participants pretest levels of LTPA and PAE, the program appears to have had more success among the girls. Boys who participated in FunAction had higher pretest LTPA levels than boys who did not participate, but female participants did not differ from female nonparticipants in this regard. In other words, FunAction was successful in engaging girls, regardless of their pre-intervention LTPA level. Regarding PAE, FunAction attracted boys with higher levels of enjoyment. However, in the case of the girls, while those in the low participation category had significantly lower pretest PAE levels than those in the high participation category, they were not significantly different than those in the medium participation category. This indicates that the program was somewhat successful in engaging girls with lower PAE. Notably the "abdominator" and Hip-Hop activities were

particularly popular among girls, but were cancelled part way through the intervention period. Perhaps, had these activities lasted the full 16 weeks, girls in the medium participation category would have ended up in the high participation category, and no significant difference between groups would have been observed.

Overall, in the FunAction study, results concerning female participants are intriguing as the literature consistently notes that adolescent girls are less physically active than adolescent boys (Barnett et al., 2002; Cameron et al., 2005; Kimm et al., 2002). Perhaps, the reason adolescent girls are less active is not because girls do not enjoy physical activity, but rather because the type of physical activities generally offered are not as appealing to girls as they are to boys. In fact, anecdotally, it appeared as though girls preferred the dance and gender segregated activities offered by the FunAction program. Moreover, although, this study's design precludes determining the mechanisms which account for girls' participation, the girls' proclivity towards certain FunAction activities could be explained by the socially supportive environment these activities provided (Dwyer et al., 2006).

A final aspect analyzed to explore our first hypothesis concerned intervention group students' appreciation of FunAction. We feel the high percentage of participants and *non* participants who were interested in the continuation of FunAction further testifies to the program's relative success. It is possible that had the intervention continued for more than 16 weeks, more students would have eventually gotten involved.

The second hypothesis explored in this study questioned whether the supply of FunAction would have a positive impact on students' LTPA and PAE. Regarding LTPA, results revealed that, although both control and intervention group students reported significantly greater LTPA scores following the intervention, the supply of the FunAction program was not the cause of the increase. This may be explained by the fact that all study participants were from the same school and, therefore, aware of the FunAction program. Hence, although control group students did not participate in program activities, FunAction may have motivated them to become more physically active. In terms of students' PAE, no change was observed for either of the study groups. It is noteworthy that, on average, all students reported relatively high levels of PAE (control = 48.6 ± 6, intervention = 48.8 ± 7.4 out of a maximum of 56) prior to the intervention. Thus, the lack of variation is perhaps not surprising. Finally, our results suggest that the level of participation in program activities had no impact on either LTPA or PAE levels. It is likely that 16 weeks was insufficient to effect a change in these variables. Indeed, the M-SPAN (McKenzie et al., 2004; Sallis et al., 2003), TAAG (Gittelsohn et al., 2006; Moe et al., 2006; Stevens et al., 2005) and ICAPS (Simon et al., 2004, 2006) interventions were between two and four years in duration.

Limitations

This study was not without limitations. The FunAction intervention lasted only 16 weeks and could not be maintained without our ongoing presence in the school setting. We, therefore, recommend that future studies of this type be carried out over a minimum of one

full school year. Ultimately, it would be preferable for such physical activity programs to become institutionalized in the school setting. We recognize, however, that such a recommendation may not be realistic owing to insufficient or competing resources. Ideally, physical activity promotion interventions should utilize additional strategies designed to involve the students, their family, and their community in order to increase participation and help ensure program sustainability (Neumark-Sztainer, Story, Tharp, & Rex, 2003; Oliveira & Garcia Bengoechea, 2006; Saunders & Moody, 2006).

Implications for Practice

The FunAction intervention was successful in engaging much of the priority population in the physical activity opportunities offered. In keeping with principles of social marketing, the FunAction program aimed to increase the participants' LTPA by promoting a program of activities based on students' needs and aspirations with the hope that they would participate. Accordingly, since physical activity interventions designed for youth should include activities which are enjoyable (Bungum, Dowda, Weston, Trost, & Pate, 2000), every effort was made to offer activities the participants would perceive as fun. Additionally, the involvement of various school actors helped us not only to supply physical activity opportunities which responded to the aspirations of participants, but also to promote the program in ways which were meaningful to participants.

Furthermore, Maibach et al. (2002) underscore the need to reduce barriers. One barrier which some authors have identified for adolescents is *lack of time* (Allison et al., 2005; Dwyer et al., 2006; Neumark-Sztainer et al., 2003). To develop the FunAction

program we worked with school actors in order to profile our priority population and as such adapt our intervention. Through this process, a lack of time after school due to familial and scholastic obligations, as well as part time work, was indeed identified as a barrier to physical activity present in the intervention group. Accordingly, we scheduled all FunAction activities during the lunch hour and we feel that this contributed to the program's relative success. Moreover, in accordance with teacher recommendations, the FunAction intervention downplayed competition by rewarding participation and team spirit rather than skill. In fact, competition and a sense that skill is needed have been identified by adolescents as barriers to physical activity (Allison et al., 2006; Dwyer et al., 2006). Actually, according to Bauer, Yang, and Austin (2004), interventions designed to achieve an increase in physical activity are more successful if these aspects are deemphasized. FunAction's success in engaging the priority population lends credence to these results.

Conclusion

The FunAction study is the first study to develop and implement a physical activity promotion program, based on principles of social marketing, among underserved eighth grade students. As such, it contributes to the literature regarding non-curricular, school based physical activity promotion programs designed for adolescents. Results of this study partially support our hypothesis because although the program had no impact on LTPA and PAE levels of the students, most participated in program activities. We feel that the level of participation in FunAction activities attests to the ability of the program to attract the priority population. Practitioners are encouraged to apply the principles and strategies used

in the FunAction project to other physical activity promotion endeavors conducted in underserved middle schools, in order to develop and promote physical activity programs which are "fun, easy, and popular" (Smith, 1999).

Acknowledgements

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References

Allison, K. R., Dwyer, J. J. M., Goldenberg, E. R., Fein, A. J., Yoshida, K. K., & Boutilier, M. A. (2005). Male adolescents' reasons for participating in physical activity, barriers to participation, and suggestions for increasing participation. *Adolescence, 40*, 155-170.

Baranowski, T., Anderson, C., & Carmack, C. (1998). Mediating variable framework in physical activity interventions - How are we doing? How might we do better? *American Journal of Preventive Medicine, 15*, 266-297.

Barnett, T. A., O'Loughlin, J., & Paradis, G. (2002). One- and two-year predictors of decline in physical activity among inner-city schoolchildren. *American Journal of Preventive Medicine, 23*, 121-128.

Bauer, K. W., Yang, Y. W., & Austin, S. B. (2004). "How can we stay healthy when you're throwing all of this in front of us?" - Findings from focus groups and interviews in middle schools on environmental influences on nutrition and physical activity. *Health Education & Behavior, 31*, 34-46.

Bungum, T., Dowda, M., Weston, A., Trost, S. G., & Pate, R. R. (2000). Correlates of physical activity in male and female youth. *Pediatric Exercise Science, 12*, 71-79.

Burton, N. W., Turrell, G., & Oldenburg, B. (2003). Participation in recreational physical activity: Why do socioeconomic groups differ? *Health Education & Behavior, 30*, 225-244.

Cale, L., & Harris, J. (2006). School-based physical activity interventions: effectiveness, trends, issues, implications and recommendations for practice. *Sport Education and Society, 11*, 401-420.

Cameron, C., Craig, C., & Paolin, S. (2005). *Local opportunities for physical activity and sport: Trends from 1999-2004.* Ottawa, Ontario, Canadian Fitness and Lifestyle Research Institute. from http://www.cflri.ca/eng/statistics/surveys/pam2004.php.

Dwyer, J. J. M., Allison, K. R., Goldenberg, E. R., Fein, A. J., Yoshida, K. K., & Boutilier, M. A. (2006). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence, 41*, 75-89.

Engels, H. J., Gretebeck, R. J., Gretebeck, K. A., & Jimenez, L. (2005). Promoting healthful diets and exercise: Efficacy of a 12-week after-school program in urban African Americans. *Journal of the American Dietetic Association, 105*, 455-459.

Gittelsohn, J., Steckler, A., Johnson, C. C., Pratt, C., Grieser, M., Pickrel, J., Stone, E. J., Conway, T., Coombs, D., & Staten, L. K. (2006). Formative research in school and community-based health programs and studies: "State of the art" and the TAAG approach. *Health Education & Behavior, 33*, 25-39.

Jago, R., & Baranowski, T. (2004). Non-curricular approaches for increasing physical activity in youth: a review. *Preventive Medicine, 39*, 157-163.

Kendzierski, D., & Decarlo, K. J. (1991). Physical-Activity Enjoyment Scale - 2 Validation Studies. *Journal of Sport & Exercise Psychology, 13*(1), 50-64.

Kimm, S. Y. S., Glynn, N. W., Kriska, A. M., Barton, B. A., Kronsberg, S. S., Daniels, S. R., Crawford, P. B., Sabry, Z. I., & Liu, K. (2002). Decline in physical activity in black girls and white girls during adolescence. *New England Journal of Medicine, 347*, 709-715.

Maibach, E. W. (2003). Recreating communities to support active living: A new role for social marketing. *American Journal of Health Promotion, 18*(1), 114-119.

Maibach, E. W., Rothschild, M. L., & Novelli, W. D. (2002). Social Marketing. In K. Glanz, Rimer, B. K., & Marcus-Lewis, F. (Eds). *Health Behavior and Health Education: Theory, Research, and Practice*, (p. 437-461), San Francisco, CA., Jossey-Bass.

McKenzie, T. L., Sallis, J. F., Prochaska, J. J., Conway, T. L., Marshall, S. J., & Rosengard, P. (2004). Evaluation of a two-year middle-school physical education intervention: M-SPAN. *Medicine and Science in Sports and Exercise, 36*, 1382-1388.

Milio, N. (1981). *Promoting Health Through Public Policy*. Philadelphia, F. A. Davis.

Moe, S. G., Pickrel, J., McKenzie, T. L., Strikmiller, P. K., Coombs, D., & Murrie, D. (2006). Using school-level interviews to develop a multisite PE intervention program. *Health Education & Behavior, 33*, 52-65.

Motl, R. W., Dishman, R. K., Saunders, R., Dowda, M., Felton, G., & Pate, R. R. (2001). Measuring enjoyment of physical activity in adolescent girls. *American Journal of Preventive Medicine, 21*, 110-117.

Neumark-Sztainer, D., Story, M., Hannan, P. J., Tharp, T., & Rex, J. (2003). Factors associated with changes in physical activity - A cohort study of inactive adolescent girls. *Archives of Pediatrics & Adolescent Medicine, 157*(8), 803-810.

Oliveira, M., & Garcia Bengoechea, E. (2005). Literature review: Building capacity in community initiatives that promote healthy living. In *Deliberative dialogue 2004–2005: Synthesis report.* Community Action Program for Children/Community Prenatal Nutrition Program.

Parcel, G. S., Kelder, S., & Basen-Engquist, K. (2000). The school as a setting for Health promotion. In B. D. Poland, Green, L. W., & Rootman, I. (Eds). *Settings for Health Promotion*, (p. 86-137), Thousand Oaks, California, Sage Publications.

Pate, R. R., Davis, M. G., Robinson, T. N., Stone, E. J., McKenzie, T. L., & Young, J. C. (2006). Promoting physical activity in children and youth - A leadership role for schools - A scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Physical Activity Committee) in collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing. *Circulation, 114*, 1214-1224.

Pavkov, T., & Pierce, K. (2006). *Ready, Set, Go! A Student Guide to SPSS 13.0 and 14.0 for Windows*, McGraw-HIll.

Sallis, J. F., McKenzie, T. L., Conway, T. L., Elder, J. P., Prochaska, J. J., Brown, M., Zive, M. M., Marshall, S. J., & Alcaraz, J. E. (2003). Environmental interventions for

eating and physical activity - A randomized controlled trial in middle schools. *American Journal of Preventive Medicine, 24*, 209-217.

Santé-Quebec (1999). *Enquête sociale et de santé auprès des enfants et des adolescents québécois: Questionnaire aux adolescents* Montréal, Qc.

Saunders, R. R., & Moody, J. (2006). Community agency survey formative research results from the TAAG study. *Health Education & Behavior, 33*, 12-24.

Simon, C., Wagner, A., DiVita, C., Rauscher, E., Klein-Platat, C., Arveiler, D., Schweitzer, B., & Triby, E. (2004). Intervention centred on adolescents' physical activity and sedentary behaviour (ICAPS): concept and 6-month results. *International Journal of Obesity, 28*, S96-S103.

Simon, C., Wagner, A., Platat, C., Arveiler, D., Schweitzer, B., Schlienger, J. L., & Triby, E. (2006). ICAPS: a multilevel program to improve physical activity in adolescents. *Diabetes and Metabolism, 32*(1), 41-49.

Smith, W. A. (1999). Marketing with no budget. *Social Marketing Quarterly, 5*(2), 6-11.

Staten, L. K., Birnbaum, A. S., Jobe, J. B., & Elder, J. P. (2006). A typology of middle school girls: Audience segmentation related to physical activity. *Health Education & Behavior, 33*, 66-80.

Stevens, J., Murray, D. M., Catellier, D. J., Hannan, P. J., Lytle, L. A., Elder, J. P., Young, D. R., Simons-Morton, D. G., & Webber, L. S. (2005). Design of the trial of activity in adolescent girls (TAAG). *Contemporary Clinical Trials, 26*, 223-233.

Stone, E. J., McKenzie, T. L., Welk, G. J., & Booth, M. L. (1998). Effects of physical activity interventions in youth. Review and synthesis. *American Journal of Preventive Medicine, 15*, 298-315.

Trost, S. G., Pate, R. R., Sallis, J. F., Freedson, P. S., Taylor, W. C., Dowda, M., & Sirard, J. (2002). Age and gender differences in objectively measured physical activity in youth. *Medicine and Science in Sports and Exercise, 34*(2), 350-355.

Wilson, D. K., Evans, A. E., Williams, J., Mixon, G., Sirard, J. R., & Pate, R. (2005). A preliminary test of a student-centered intervention on increasing physical activity in underserved adolescents. *Annals of Behavioral Medicine, 30*, 119-124.

Annexe 1

Questionnaire: *Parle-nous de toi et de ta pratique d'activités physiques*

PARLE-NOUS DE TOI ET DE TA PRATIQUE D'ACTIVITÉS PHYSIQUES

Étude sur la pratique d'activités physiques et les conditions d'apprentissage des élèves de 1ère et 2e années de secondaire de l'École secondaire St-Laurent - Pavillon St-Germain

Responsable : Suzanne Laberge, Ph.D., Université de Montréal

Directives

- Pour chacune des questions, encercle le chiffre qui correspond le mieux à ce que tu es, ce que tu penses ou ce que tu ressens. Pour quelques questions, tu auras à indiquer un chiffre, ou encore à répondre par quelques mots ou quelques phrases.

- IL N'Y A PAS DE BONNES OU DE MAUVAUSES RÉPONSES et aucune note n'est associée à tes réponses à ce questionnaire; donc tu peux répondre sincèrement et sans crainte.

- Nous te demandons ton nom uniquement parce que nous devrons faire le suivi avec tes réponses à un questionnaire auquel tu répondras au mois de juin prochain. Ton nom sera effacé par la suite et aucune personne ne pourra savoir ce que tu as répondu.

- Si tu as de la difficulté à comprendre certains mots, n'hésite pas à demander l'aide de ton professeur.

MERCI DE TA PARTICIPATION À CE PROJET DE RECHERCHE !

Tes activités physiques et sportives

1. Durant tes TEMPS LIBRES, au cours de la DERNIÈRE SEMAINE, as-tu pratiqué des activités physiques ou sportives (par ex. course, marche rapide, aérobie, natation, sports d'équipe) qui t'ont fait transpirer ou respirer rapidement?
   Pour chaque jour de la semaine dernière, encercle le chiffre correspondant au nombre de minutes (environ) pendant lesquelles tu as fait de l'activité physique ou sportive.

	0 à 14 min.	15 à 29 min.	30 à 44 min.	45 à 59 min	60 min. et +
Lundi	1	2	3	4	5
Mardi	1	2	3	4	5
Mercredi	1	2	3	4	5
Jeudi	1	2	3	4	5
Vendredi	1	2	3	4	5
Samedi	1	2	3	4	5
Dimanche	1	2	3	4	5

2. Pour <u>chacun</u> des énoncés suivants, indique dans quelle mesure cela correspond à ce que tu ressens. Encercle le chiffre qui est le plus près de ton degré d'accord avec l'énoncé.

En général, quand je fais de l'activité physique….	**Tout à fait d'accord**	**Plutôt d'accord**	**Plutôt en désaccord**	**Tout à fait en désaccord**
A. j'aime cela	1	2	3	4
B. cela m'ennuie	1	2	3	4
C. je déteste cela	1	2	3	4
D. je trouve cela agréable	1	2	3	4
E. je n'ai aucun plaisir	1	2	3	4
F. cela me donne de l'énergie	1	2	3	4
G. cela me fatigue	1	2	3	4
H. c'est beaucoup «le fun»	1	2	3	4
I. je me sens bien dans ma peau	1	2	3	4
J. j'en retire quelque chose de positif	1	2	3	4
K. c'est très excitant	1	2	3	4
L. c'est frustrant	1	2	3	4
M. ce n'est pas du tout intéressant	1	2	3	4
N. cela me donne l'impression de réussir quelque chose	1	2	3	4

Ton appréciation de FunAction

3. Aimeriez-vous que FunAction poursuive des activités avec vous en Secondaire 3?

- Non, pas vraiment 1
- Oui, peut-être 2
- Oui, certainement 3

Informations générales

4. Quel âge as-tu?_____ ans

5. Es-tu... ?
   - Un garçon 1
   - Une fille 2

6. Tu es en :
   - 1ère année du secondaire 1
   - 2e année du secondaire 2

7. Es-tu né(e) au Québec?
   - Oui (**passe à la question 24**) 1
   - Non 2

Annexe 2

Ethics Certificate

Université de Montréal
Faculté des sciences de l'éducation
Vice-décanat aux études supérieures et à la recherche

Montréal, 7 avril, 2005

Suzanne Laberge
Professeure titulaire
Département de kinésiologie
Université de Montréal
CEPSUM
2100 Édouard-Montpetit, bureau 7227
Montréal, Qc
H3T 1J4

Objet: Certificat d'éthique no ETH-2004-62
Chercheure : Suzanne Laberge
Organisme subventionnaire : Comité de gestion de la taxe scolaire de l'Île de Montréal

Cher Madame,

Le Comité d'éthique de la recherche plurifacultaire a examiné le projet de recherche intitulé :
« Recherche action sur les impacts de l'activité physique auprès de jeunes de milieux scolaires défavorisés »

Le Comité a conclu que le projet respecte les normes de déontologie habituelles dans l'expérimentation avec des êtres humains.

Ce certificat est cependant émis conditionnellement au fait que la chercheure principale nous transmette annuellement le questionnaire «Suivi des projets de recherche» dûment complété et signé, à défaut de quoi, le présent certificat deviendra nul et sans effet.

Espérant le tout conforme et à votre satisfaction, je vous prie d'agréer l'expression de mes sentiments distingués.

Le président,

[redacted]

François Bowen

cc : Michel Rivest

FB/km

C.P. 6128, succursale Centre-ville
Montréal (Québec) H3C 3J7

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Annexe 3

Research Article Co-Authors' signatures

Accord de la coauteure

1. Identification de l'étudiant et du programme

Nom : Bush, Paula Louise
Programme : 2-350-1-0 M.Sc. en sciences de l'activité physique

2. Description de l'article

Titre de l'article : Physical Activity Promotion among Underserved Adolescents : « Make it Fun, Easy, and Popular. »

Auteures : Bush, Paula Louise, M.Sc.
Laberge, Suzanne, Ph.D., Université de Montréal
Laforest, Sophie, Ph.D., Université de Montréal

Périodique : *Health Education and Behavior*

Description : L'article sera soumis pour publication en hiver 2007.

3. Déclaration de la coauteure

À titre de coauteure de l'article identifié ci-dessus, je suis d'accord pour que Paula Louise Bush inclue cet article dans son mémoire de maîtrise qui a pour titre : *Sports, Physical Activity and Academic Performance : Promoting Physical Activity among Underserved Adolescents*

Suzanne Laberge [redacted] 21 déc 06

Coauteure Signature Date

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Sophie Laforest [redacted] 12/06

Coauteure [redacted] Date